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ABSTRACT

The college careers of students who had participated in the Advanced Placement Program (AP) in secondary school were studied, based on extensive information on 4,814 students who participated in the Personal Qualities Project, a longitudinal study in nine colleges and universities. The project included information on 1,115 AP and 3,699 non-AP students. The two groups were contrasted on a number of measures: background characteristics, special achievements in secondary school, goals and interests, experience in college, and different measures of success. Various subgroups of AP students were also compared. Areas of study included: how AP and non-AP students compare at the time of college entry; whether AP and non-AP students take a similar academic program on a similar schedule; how AP students perform academically through 4 years; whether there are differences between AP and non-AP students generally comparable for major groups of students; whether advanced placement in particular subjects reduces the likelihood of students taking college coursework in those areas; and whether the AP grade is a useful predictor of college performance. The Personal Qualities in Admissions Research Questionnaire is appended. (SW)

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College Board Report

No. 86-2

FOUR YEARS LATER

A Longitudinal Study of Advanced Placement Students in College

Warren W. Willingham
Margaret Morris

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Four Years Later: A Longitudinal Study of Advanced Placement Students in College

Warren W. Willingham
Margaret Morris

College Board Report No. 86-2

ETS RR No. 85-46

College Entrance Examination Board, 1986

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ABSTRACT

The Advanced Placement (AP) Program provides a means whereby students can take college-level work in secondary school, sit for standard end-of-course examinations, and, if successful, be placed forward with college credit. Using data from the Personal Qualities Project, this study examined various aspects of the experience and success of 1,115 students through four years. AP students, when compared with non-AP students matched on six preadmissions measures, were found to have better academic records, and to be more successful overall. This pattern was especially characteristic of students with AP grades of 3 or higher—a result that tends to validate the program's recommendation that colleges award credit for grades of 3 to 5. It was also found that students taking an AP Examination in a given subject area were more likely to take college coursework in that area than students who had not done so.

1. INTRODUCTION

What was the most sweeping and significant change in American education in the first half of the twentieth century? Many would say the move to essentially universal secondary education and the associated development of the comprehensive high school. This democratization of secondary education produced many social benefits. It also created some awkward side effects. One such negative effect was to worsen the already difficult problem of articulation between secondary and higher education.

All students do not move at the same pace. Since some are ready for college-level work earlier than others, a standard secondary curriculum and a fixed school-leaving age are likely to be arbitrary impediments to the educational development of many of the country's more able students. It has been a hotly debated issue. Does one jeopardize normal maturation by moving able students on to college at an early age? Or does one beef up the high school curriculum for those ready for advanced work? If the latter course is followed, how do students avoid having to repeat in college work already mastered at the secondary level?

In the second half of this century educators have experimented with a number of programs in an effort to alleviate the structural rigidity imposed by secondary schooling for all. The experimental models have included the three-year baccalaureate program, the so-called middle college, and various schemes for early admissions (see Willingham 1974 for an overview). The most successful effort by far has been the Advanced Placement (AP) Program of the College Board. The AP Program took the simplest approach to the problem—encourage college-level coursework in secondary school and give college credit wherever it is due. The program incorporated three essential elements: detailed course outlines, a series of examinations offered once a year, and a national associational and staff network to carry out the work of the program and maintain communication among students, schools, and colleges.

It is the extensive involvement of school and college teachers that has been most instrumental in establishing and maintaining the validity of the program. These subject matter specialists serving as instructors, committee members, and graders determine the two critical aspects of the program's validity: the actual content of the courses and examinations, and the standards that are represented in the one-to-five grade scale used for credit recommendations.

College faculties determine whether a given grade on an AP Examination is a valid basis for awarding credit at their institution by undertaking two assessments. The first is to examine the AP course syllabus and related materials on grading standards (for example, see Bannister 1983; College Board 1980, 1983; Vaughan 1983) in order to compare these with expectations for their own students. A second necessary step is to monitor placement practice locally in order to assure that students placed forward in individual college subjects are performing satisfactorily.

Evaluations of the program have typically been quite positive. A series of studies documented statistically the ordinarily strong academic achievement of AP students; other reports have recorded the largely positive accounts of students and faculty, giving their view of the educational benefits of the program. A major reason for the good college performance of AP students recommended for advanced standing is that, by tradition, AP Examination readers have applied rigorous standards to a group of students already carefully selected by the secondary schools. This is apparent from research that has examined in some detail the grades students make on AP Examinations compared with grades earned in corresponding college courses (see Related Studies section for a review of these and related studies).

In summary, one might say that the program has succeeded owing to a sound rationale that is well executed—content-valid examinations, high standards, and locally monitored college credit policies. And succeed it has—from some 1,000 candidates in 100 schools in 1955 to well over 150,000 candidates from 5,800 schools three decades later. Thus, the AP Program has become a major force in secondary education, helping to foster an enhanced quality of schooling for a substantial proportion of the most able students across the country (more than one in three of those students score 600 or better on the SAT). The increasing size and significance of the AP Program is, in itself, a good reason for learning more about it.

It is one thing to ask whether the content of each examination is appropriate, whether the standards and credit policies in individual subjects are well set, whether students placed ahead do satisfactory work in the sequent course. These are important questions that bear on the validity of the examinations and the placement procedures. The program has given attention to these matters in other reports. But in judging how well the Advanced Placement Program works overall as an educational strategy, it is useful to step

back and ask how AP students do through four years of college. That is the main issue addressed here though we have examined some additional questions as well.

For instance, how do AP students compare with their classmates at entry—not only as to their academic ability, but also as to their patterns of achievement, their interests and goals? How do they progress through college after the first year? If these students are more able than the average freshman, as seems generally the case, do they live up to their promise? Is the typical pattern of experience and performance of AP students fairly consistent, or are there important differences among different groups of AP students, for example, those who wrote different AP Examinations or attended different colleges? And what are the long-term implications of the AP grade record? What can the quality and quantity of AP grades submitted tell us about the likely performance of a student through the undergraduate years?

There have been only limited attempts to document and expand on this longer view of the performance of AP students. The principal reason is that answering the questions just posed requires an extensive amount of information on AP students over several years—data that simply have not been available. The study here reported takes advantage of an ideal set of data collected for another purpose.

Over a period of five years the Personal Qualities Project assembled a very extensive body of information about each of 4,814 students who entered one of nine cooperating institutions in 1979. Findings for the admissions phase of that project were reported in *Personal Qualities and College Admissions* (Willingham and Breland 1982). The follow-up phase of the project is described in *Success in College* (Willingham 1985).

The Personal Qualities data base included 1,115 AP students. In forging a link between the AP Program files and the Personal Qualities data base, we have been able to learn a great deal about this sizable group of AP students. Section 4 of this report, Description of This Study, briefly describes the earlier study as well as the sample, the measures, and the analytic procedures used here. Sections 5 through 9 give the results. Briefly, they focus on the following themes.

Section 5 documents substantial differences between AP and non-AP students at college entry, especially differences in ability and achievement. Section 6 describes the experience of AP and non-AP students in college. These data show that the AP students were consistently high achievers, not only in scholarship but also in leadership and in the faculty's view of the "most successful" students overall. Comparison of AP students with a matched group of non-AP students indicated that the AP students were superior achievers even after taking account of their academic ability and prior record of achievements in secondary school.

Section 7 shows some interesting sex differences but the important findings here are that (a) differences between AP and non-AP students were fairly consistent across colleges and (b) the superior achievement of AP students seems associated with their participation in the AP Program as well as the strength of their secondary school.

Section 8 examines differences among students who submitted different numbers of AP grades and earned different grades. This section shows more than any other that all AP students are not the same. Those who earned fours and fives were quite outstanding in college. Section 9 reveals commonalities as well as sharp differences among students who sat for different AP Subject Examinations. Finally, Section 10 summarizes what the authors see as the main findings and implications of the analysis.

2. DESCRIPTION OF THE AP PROGRAM

Since its inception in 1955, the Advanced Placement Program, sponsored by the College Board, has been administered by Educational Testing Service (ETS). The program began with 1,299 participating students from 104 high schools. The majority of these high schools were in the Northeast. Today more than a quarter of the nation's high schools take part in the program, and in 1984, 177,000 students took 240,000 AP Examinations. The program's growth has been almost continuous since 1955. The number of participating students and schools leveled off somewhat during the late 1960s to the early 1970s. Over the past decade, however, the program's growth has been rapid (see Figure 1).

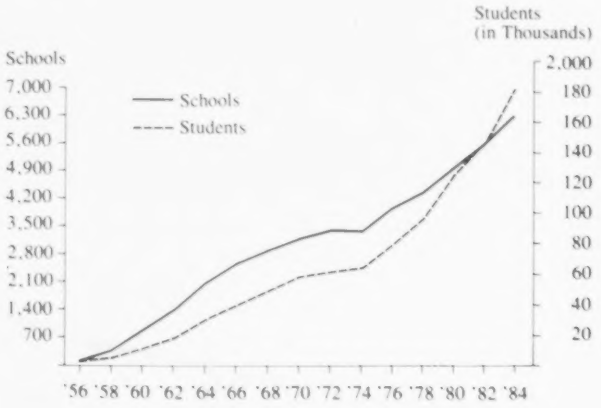

Figure 1. Growth of the Program Since Its Inception

This growth can be seen not only in the increased number of students and schools participating, but also in the increased number of colleges willing to grant advanced placement and/or credit on the basis of AP coursework. By a recent count (College Board 1985) more than 1,000 colleges regularly grant credit and/or advanced standing for grades of 3 and higher. More than 900 institutions are willing to offer sophomore standing on the basis of AP course credits.

Part of this growth can be attributed to the attitude that

the program is a practical means of strengthening secondary school programs. For example, James B. Conant, in his influential study (1967), recommended to parents and school boards that participation in the Advanced Placement Program was one important mark of quality in the academic program of a comprehensive high school.

Some state legislatures have come to view the program similarly. Recently, Florida, Louisiana, and Utah passed legislation which grants financial incentives to schools that participate in the program. South Carolina now has a state-financed program requiring that all public schools offer AP courses, that AP students take the national examinations, and that public colleges in the state implement appropriate Advanced Placement Program policies. Similar programs are being considered in other states.

Advanced Placement Examinations are administered nationally once a year. They are offered in a variety of subjects, ranging from studio art and computer science to the more conventional areas of literature and natural science. In 1984, 24 different examinations were given in 14 subject areas. Table 1 lists the subject areas and number of examinations written in each. The most popular subjects, in terms of the number of candidates presenting themselves, were English literature and composition, American history, and mathematics (calculus). These examinations accounted for 25, 21, and 17 percent, respectively, of the total number of examinations taken that year.

Table 1. Participation in the Advanced Placement Program by Subject Area—1979 to 1984

	Number of Examinations		
Subject	*1979*	*1984*	*% Increase*
American History	28,222	49,939	77%
Art	1,363	2,536	86
Biology	12,835	19,387	51
Chemistry	7,016	11,539	64
Computer Science	*	4,262	*
English	41,975	71,263	70
European History	6,961	12,609	81
French	4,409	6,843	55
German	757	1,631	115
Latin	1,016	1,704	68
Mathematics	24,727	39,962	62
Music	850	621	−27
Physics	5,039	8,380	66
Spanish	4,374	8,990	106
Total	139,544	239,666	72%

*Not offered in 1979

Table 1 also shows the number of examinations written in the various subjects in 1979, the year in which the Personal Qualities cohort graduated from high school. For each subject the percent increase from 1979 to 1984 is indicated as well. During this period the number of AP Examinations increased by 72 percent and volume in virtually all subjects increased substantially. While the number of examinations did increase in the natural sciences—biology, chemistry, mathematics, and physics—it is noteworthy that in none of these four subjects did it increase as much as did the AP Program overall.

In each subject area the AP Examination is prepared by a committee of high school and college teachers with the assistance of test specialists. This facilitates the communication between the high schools and colleges that is necessary for such a program to work. The examinations, with the exception of Studio Art, are made up of a multiple-choice and a free-response section. The free-response section is graded by high school and college teachers who convene after the examination period. For each subject, the grading process is overseen by a chief reader who also meets with the College Board's development committee. These individuals provide a liaison between the groups constructing and reading the examinations. Grades reported range from 1 to 5, and are associated with the following values: 5—Extremely well qualified, 4—Well qualified, 3—Qualified, 2—Possibly qualified, 1—No recommendation.

The courses offered by the secondary schools to prepare students for these examinations are under the direct control of the schools and teachers involved. However, to aid schools in developing appropriate curricula, the College Board supplies course guidelines and organizes conferences and workshops countrywide. This is done on a subject-by-subject basis, with each subject committee operating within guidelines but otherwise independently.

A series of publications is available in each subject area. For example, information on the AP American and European History Examinations is available in the College Board's Advanced Placement Course Description for History (1985). This publication includes sample examinations for the two AP History courses as well as guidelines for developing suitable preparatory courses. A general description is also available in The History Examinations of the College Board: 1980-82 (1980). Vaughan (1983) describes the grading standards for the free-response portion of the American History Examination, providing sample answers and the grades they received. Bannister's Teacher's Guide (1983) describes four sample syllabuses in history, together with suggestions for student selection, use of library resources, and descriptions of class formats that have proved useful to AP instructors. Similar publications are available for the other AP subjects. Since the soundness of the program is heavily dependent upon the learning experience, the development and effective presentation of appropriate high school courses is a critical aspect of the program.

3. RELATED STUDIES

In 1966 Casserly published a detailed documentation and analysis of college policies concerning the Advanced Placement Program. All colleges receiving AP Examination grades in 1963 were contacted and asked to indicate their place-

ment policy with regard to students submitting AP grades (that is, placement and credit, placement only, credit only, other). The colleges responded well, yielding information on policies covering 97 percent of all AP candidates for that year. Casserly grouped the institutions by College Board region and by college type (defined in terms of the number of AP students attending the institution). Mean AP grades for placement decisions were then presented for each college region and college type. Placement decisions were analyzed in the same manner for individual AP subjects.

Results of an interview study in 63 of the institutions were also reported. Casserly (1968, 1968a) published two reports, one technical, one nontechnical, based on interviews with AP students at 20 institutions. She described students' experiences of and attitudes toward the AP Program, capturing well the enthusiasm the program often engenders among students. The nontechnical report did not attempt to document or evaluate in a quantitative manner, but of all the reports available on the Advanced Placement Program, Casserly's 1968 study gives the most extensive description of the AP student. It is particularly readable and is still widely distributed and cited.

In 1967 Burnham and Hewitt conducted one of the first systematic institutional analyses of the performance of Advanced Placement students in college. The main purpose of this study was to confirm statistically previous positive but largely informal assessments. The study was in two parts. Part I was based on the class of 1963 at Yale University, for whom four-year records were available. The AP subjects considered here were English and mathematics. Part II was a two-year study of the class of 1967 based on the seven subjects most commonly presented by AP students at Yale. In both studies the authors were primarily concerned with the performance of AP students, as measured by college grades, in courses that were related to their AP subject, and the extent to which their performance in these courses differed from that of non-AP students. Their findings indicated that, in general, AP students were a superior group of students prior to college entry (i.e., higher mean SAT and achievement scores), that they performed better than non-AP students, and that they took more college courses in their AP subjects than did non-AP students.

Ruch (1968) examined some of the same questions addressed by Burnham and Hewitt. He used 21 matched pairs from the same high school (matched for rank, SAT scores, college attended, and in 16 of the 21 cases, senior year curriculum). Ruch compared the students on three measures—continuation of the AP subject at the college level (the non-AP students had taken courses in the same area as the AP students), college grade in the AP subject, and overall freshman grade. He did not find a statistically significant difference between the two groups on the last two measures, but found that more AP students continued with the AP subject than did non-AP students (19 vs. 12). The study is limited in scope, few data are available on the subjects, the sample is very small, and the matching technique employed is crude. Nevertheless, the study is cited in later research as evidence of the superior performance of AP students (Chamberlain, Pugh, and Schellhammer 1978; Simms 1982).

A more extensive matched group study was conducted by Chamberlain, et al. in 1978. They compared 344 AP freshmen at Indiana University with an equal number of non-AP freshmen. The two groups were matched by sex and SAT distribution. Three measures of academic progress were used over a four-year period—hours completed per semester, proportion of courses taken at the junior level or above, and cumulative GPA. On all three measures AP students were found to perform better than non-AP students. The limitations of these measures of progress notwithstanding, the study is interesting and one of the better designed among those that address college performance generally.

A faculty committee at Duke University (Cahow, et al. 1979) undertook a general evaluation of the Advanced Placement Program as reflected in the performance of AP and non-AP students at the institution. The committee concluded that Advanced Placement courses are used to supplement rather than to replace college courses and that relatively few matriculants with Advanced Placement credits use them to graduate early. A group of Advanced Placement students was judged to be superior to the non-AP students with respect to all measures of academic quality that were considered: freshman year grade average, overall grade average, election to Phi Beta Kappa, and graduation with distinction. The committee did not attempt to compare AP students with non-AP students of comparable academic ability but did conclude on the basis of its investigation that the program is well designed and competently administered and supportive of the educational aims of the university.

A study at the University of Michigan (Simms 1982) compared the performance in upper-level courses of AP students who had been given credit for AP work with that of non-AP students. The latter had completed University of Michigan introductory courses. The AP group had achieved a grade of 3 or more on all AP Examinations for which they were given college credit. The non-AP group was selected randomly from among those enrolled in introductory courses. Here again the main purpose of the study was one of validation through confirming satisfactory performance following advanced placement. Simms's main conclusion is that AP students are sufficiently prepared prior to college entry to enroll directly in upper-level courses, and that they do not suffer academically as a result of this policy. The groups were not matched for ability or other measures of achievement, but this is not inconsistent with the main purpose of the study.

In a recent study of Penn State freshmen, Dickason (1984) compared the predicted and actual freshman GPA for students who had taken honors-level courses in secondary school, and students who had not. The main question addressed was whether, in evaluating candidates for admission, high school grades should be adjusted to take account of

honors courses. This study did not examine AP students per se but is relevant here because it speaks to the question of how students who have taken demanding courses in secondary school perform in college as compared to students who have taken a more standard set of courses.

Dickason's results indicated that an increase of .05 per honors course would more accurately predict freshman GPA than the use of an unaltered high school grade. It is important to note that the high school grade average used was based on Penn State's computation, which included only "solid courses" taken between the ninth and the eleventh grades, not the high school grade average reported by the student and presumably based on all courses taken. The mean high school average reported by the nonhonors students was 3.25, .27 higher than that computed by Penn State, and for the honors students was 3.46, .15 higher than the university's computation. Thus an adjustment in favor of the honors students had evidently already taken place. Dickason concluded that the difference in the performance of honors and nonhonors students at Penn State, while statistically significant, was not sufficiently consequential in the admissions process to warrant modification in the high school grade average as computed by the university.

These are studies on overall academic performance of AP students, but a number of studies of specific examinations have been conducted in the last ten years (Liskin-Gasparro, Modu, and Schraibman 1979; Modu, Reed, and Coon 1975; Modu and Taft 1982; Modu and Weeks 1982; Modu and Wimmers 1981; Pfeiffenberger and Modu 1977). Typically, these studies compared the performance of AP students with that of college students taking the same AP Examination (or part of it). In the case of the language examinations, AP students were compared with second- and third-year college students, because success on the AP Examinations is considered to be equivalent to three years of college coursework in a foreign language.

In these studies the distribution of college grades was also compared with the distribution of AP grades for both groups of students. In the various subject areas it was consistently found that on the average, AP students did as well or better on the AP Examination as did their college counterparts. Typically, the non-AP college students made substantially more A and B course grades than they did test scores equivalent to an AP grade of 5 or 4. A recent, as yet unpublished, validity study (Mazzeo and Bleistein) for the music theory examination yielded contrary results. The general pattern of these studies, however, suggests that the AP scale of 1 to 5 is rigorous in comparison to college grading in comparable courses.

In summary, the available literature indicates with some consistency that the AP candidate is most typically a good student who performs well in college. There have, however, been relatively few systematic follow-up studies beyond the parallel or sequent course in the subject. Research that is broadly concerned with the experience and performance of AP students through the college years has most typically focused on grade-point average, seldom involved comparison with a matched sample of similar ability, and is largely restricted to unpublished institutional reports. This survey of available studies confirmed our impression that a detailed analysis of the college performance of AP students would be a useful addition to current information about AP students.

4. DESCRIPTION OF THIS STUDY

This study made extensive use of a data base developed in the Personal Qualities Project. In order to describe the present work, it is necessary first to provide some background on the earlier study. The Personal Qualities Project was initiated in 1978 by the College Board and Educational Testing Service. Nine institutions—Bucknell University, Colgate University, Hartwick College, Kenyon College, Kalamazoo College, Occidental College, Ohio Wesleyan University, University of Richmond, and Williams College—all of whom use the Common Application form, were active collaborators over a six-year period.

The first phase of the study focused on the admissions process and extended through the freshman year. Application data were collected on the 25,000 students applying to these colleges. The aim was to determine the extent to which personal qualities (for example, background characteristics, special accomplishments, goals, and interests) played a role in the admissions process and whether actual selection decisions reflected the policy intentions of the institutions. The students completed two questionnaires during this phase of the study—one upon enrolling and the other at the end of the freshman year. These questionnaires yielded information on the students' goals, satisfaction regarding their progress toward those goals, academic interests, probable major, and long-term career plans. For an account of this phase of the project, see *Personal Qualities and College Admissions* (Willingham and Breland 1982).

The second phase of the Personal Qualities Project gave considerable attention to different measures of success through four years of college. We were interested in what types of preadmission information might be useful in forecasting which students are later regarded as most successful by the institution. During this second phase of the study, a third questionnaire was administered to the students in the middle of the senior year. This questionnaire again asked students to rate their satisfaction regarding progress toward goals that they considered to be important. It also solicited information about specific college experiences, coursework completed, and plans for advanced study and career. Students were also provided an opportunity to nominate peers whom they considered to be most successful.

In addition to this student assessment of the college experience, a variety of information was collected from the faculty and from college records. These data included objective measures of different types of achievements, information concerning elected or appointed positions of leadership,

grades earned, persistence to the senior year, and time until graduation. At each college, a committee was formed in order to determine what types of accomplishments and leadership positions constituted significant achievements on that campus. The committee also identified a group of students considered most successful overall in meeting the educational objectives of the institution. A description of the success measures and an account of the results of the follow-up phase of the project are reported in *Success in College* (Willingham 1985).

To the data available from the Personal Qualities Project were added advanced placement information about the individual students and the high schools they attended. This information was available from AP grade transcripts for individual students, AP rosters sent to the colleges in the summer of 1979, and from other supplementary reports of participating high schools that are routinely prepared by the program. Thus it was possible to identify all students in the Personal Qualities file who had participated in the AP Program and to retrieve the essential facts of that participation—the number of examinations written by the student, the subject areas represented, and the grade earned in each case.

We have referred to students who submitted one or more AP grades as "AP students" throughout this report. We have also occasionally referred to students who earned AP grades of 3 or higher (or AP grade averages when more than one was available) as successful AP students, since 3 is the grade level at which the AP Program considers the student to have qualified for advanced placement and/or credit. This is the most common grade level at which the colleges set their cut-off score for placement or credit.

It is important to appreciate that success in the AP Program comes as a result of successful negotiation by the student of several decisions or hurdles: (1) taking a secondary school course known to be quite demanding, (2) successfully completing the course, (3) taking the examination offered by the AP Program, (4) earning a grade of 3 or higher, (5) submitting a grade of 3 or higher.

These five steps constitute a winnowing process that is not possible to describe quantitatively with any accuracy. While it is well known that many students participate in AP courses without taking the examination, the only numerical evidence of that practice lies in the fact that the average number of AP Examinations by subject within individual schools is typically only about 7 students. Even among students who took AP Examinations in 1984, about 1 in 6 did not request in late spring that grades be sent to a college. Some of these may not have matriculated; some others sent in special transcripts in the summer, and therefore the latter group would appear in this sample.

Why would students not take the examination or not send the grade on to a college? There are probably a variety of explanations, including the student's uncertainty about going to college in the fall, or if so, indecision about where to go to college. Some students might elect not to take the examination or not to send in their grades if they felt they did not do well in the course. For whatever reason some may prefer to take the first course in the subject in college. Presumably some did not sit for the examination because their interest in or expectation of advanced standing in the subject was not sufficient to offset the cost of the examination. It is uncertain how these selective forces operate, but it is arguable that merely submitting an AP grade to a college establishes to some extent successful participation in the AP Program. Achieving an AP credit grade of 3 or higher is, however, the critical mark of successful participation.

For some analyses we have simply defined successful AP students as those whose average AP grade was 3 or higher. But for some analyses it was desirable to estimate more accurately whether students had actually been awarded credit. It was not possible to obtain such information on actual decisions, but we were able to approximate such decisions from AP credit policies stated in the college catalogs for 1979 and in *College Placement and Credit by Examination* (1978). In most cases those two sources were in agreement, or one clearly superseded the other; if not, we accepted the lower grade. Thus, credit determinations for these students were based on the student's AP grade and the college attended. We defined a subgroup of students who achieved such credit levels in two or more subjects in order to approximate that group of students who obtain a significant leg up on their college course requirements through the AP Program.

For our purposes it was also desirable to characterize each of the secondary schools from which these students came as to the degree of participation in the AP Program. The best available evidence on that issue was the number of students who sat for the various AP Examinations in individual secondary schools across the country. Since the number of AP subjects offered by the school was especially relevant to our analyses, we tabulated for each of the 2,178 secondary schools represented in our sample how many examinations were written by at least three students. Schools that met that criterion in one to four subjects were defined as "light AP" schools; those with five or more subjects were defined as "heavy AP."

The Sample

Among the 4,814 matriculating freshmen in the Personal Qualities study, 1,115 (23 percent) submitted an AP grade. The percentage varied substantially from college to college (7 to 46 percent). Overall the nine colleges received 1,954 AP grades. About half of the AP students sent in one grade; one-quarter sent in two grades, and almost another quarter submitted three or more. One AP student out of four earned AP grades that were, on the average, lower than 3; the majority received grades from 3 to 4; 15 percent earned grades that averaged better than 4.

The AP students in this study came from 717 different secondary schools, practically all of which had organized

AP programs (students can study for AP Examinations independently). Looking at the entire group of 4,814 freshmen at these nine colleges, about three out of four came from a school where there was an AP program. In about half of these cases the school had what was characterized above as a light AP program; in the other half, the school had a heavy AP program.

A number of the AP Examinations were written by too few students to analyze separately, so for purposes of this study, it was useful to classify students according to six subject areas. The number who submitted one or more AP grades in the six areas selected for analysis (setting aside 14 grades in art and music) was as follows:

English	618
History	379
Languages	157
Biological Science	183
Mathematics	382
Physical Science	122

How does the sample in this study compare with AP students nationally? The first and most obvious difference is that these students all matriculated at private liberal arts institutions. That is important to bear in mind in interpreting these data. How does the sample compare otherwise to AP students generally? In 1979, the year that our sample (PQ/AP) graduated from high school, 106,052 students took 139,544 AP Examinations. That is about 1.3 examinations per student nationally as compared with 1.7 examinations per student in the PQ/AP sample.

The pattern of subject examination grades submitted by the PQ/AP sample was similar to the pattern of AP Examinations administered nationally in 1979 (compare figures cited above with those in Table 1). There were some differences in history, which constituted a smaller proportion of AP/PQ grades than was true nationally (20 percent vs. 25 percent) and in physical science, which was more often represented in this sample (7 percent vs. 4 percent). AP grades in this sample were somewhat higher than was true nationally. Among the PQ/AP students 84 percent of the AP grades submitted were 3 or higher; nationally the corresponding figure was 69 percent.

Other characteristics of the national AP group are not readily available; however we do have (courtesy of Carl Haag) some additional descriptive statistics on students who participated in the Admissions Testing Program and also earned AP grades of 3 or higher. Comparing this norm group with our sample, similarly restricted to AP grades of 3 or better, we observe the following.

Males and females were fairly evenly represented in the national group (52 percent male) as was the case in the the PQ/AP group (50 percent male.) The PQ/AP group was also similar to the national group on high school rank—60 percent of the PQ/AP sample achieved a rank in the top tenth, while 57 percent of the national group achieved such a rank. There were, on the other hand, substantial differences in SAT scores for the two groups. In the PQ/AP group 56 percent had SAT-verbal scores of 600 and above, and 68 percent had SAT-mathematical scores of 600 and above. For the national group, the comparable figures were 35 and 51 percent. Degree aspirations showed a similar difference; 86 percent of the PQ/AP group hoped to complete an advanced degree while 69 percent of the national group had such aspirations. Compared to the national group considerably more of the PQ/AP students intended to major in arts or humanities (20 percent vs. 12 percent). Given that the PQ/AP students were enrolled in liberal arts colleges, this last discrepancy is hardly surprising.

The present sample appears, then, generally comparable to the national group in most respects. These PQ/AP students are, however, somewhat more able academically as indicated by greater frequency of high SAT scores and high AP grades, more grades submitted per student, and higher educational aspirations. These differences reflect the relatively selective admissions policies of this group of colleges. While the differences are worth noting, they pose no special problem because the analyses of greatest interest here involve comparing subgroup students who are otherwise similarly situated (that is, AP vs. non-AP in the same college).

The Measures

The following is a list of measures used in this study. Variables 1 through 116 were used in the Personal Qualities Project and are further defined in the reports cited. The remaining measures are particular to this study. They are defined above or are self-explanatory. Many of these measures are expressed here as dichotomies (that is, yes or no) in order to simplify the various profile tables.

Background Characteristics

1. Sex (1 = female, 0 = male)
2. Minority student (black, Hispanic, American Indian)
3. Disadvantaged (aid applicant, neither parent employed at a level higher than clerical)
4. Distant resident (home more than 400 miles from college)
5. Local resident (home within commuting distance of college)
6. Private high school
7. Large public high school (more than 500 students in senior class)
8. Small public high school (100 students or less in senior class)
9. Public high school, 67% or more of senior class to college
10. Public high school, 34-66% to college
11. Public high school, 33% or less to college
12. Parent occupation prominent (very high-level professional, elected or appointed officials, upper-level management)

13. Parent highly educated (doctorate or equivalent)

Admissions Process and Ratings

14. Interview (1 = came for interview, 0 = did not)
15. Early applicant
16. Multiple Applicant (two or more of the nine colleges in this study)
17. Outstanding interview (highest rating on 3-point scale)
18. Mature (flagged by admissions staff)
19. Intellectual orientation (flagged by admissions staff)
20. High academic rating (5 on a 5-point scale)
21. High personal rating (5 on a 5-point scale)

High School Achievement

22. Rank in class (1 = top decile, 0 = not in top decile)
23. High SAT (SAT-verbal and -mathematical average 600 or greater)
24. Academic honors (4 or greater on a 5-point scale)
25. Community activities (for example, treasurer, county-level 4-H) (4 or greater on a 5-point scale)
26. Athletic achievement (for example, member of championship team) (4 or greater on a 5-point scale)
27. School leadership (for example, president of student council) (4 or greater on a 5-point scale)
28. Creative talents (for example, all-state band or chorus) (4 or greater on a 5-point scale)
29. Follow-through (5 on a 5-point scale, evidence of multiple-year involvement in at least two extracurricular activities, with advancement and achievement)
30. Personal statement writing (5 on a 5-point scale)
31. Personal statement content (5 on a 5-point scale)
32. Personal statement overall (average of writing and content rating greater than 4)
33. Teacher reference (5 on a 5-point scale)
34. School report (5 on a 5-point scale)
35. School reference (average of teacher reference and school report greater than 4)

Reasons for Attending Particular College (from freshman questionnaire)

36. General academic reputation
37. Campus beauty
38. Particular academic program
39. Location
40. Teaching emphasis

Educational Goals (checked "very important" on freshman questionnaire)

41. Liberal education
42. Intellectual skills
43. Moral values
44. Social awareness
45. Creative talents
46. Physical development
47. Leadership training
48. Personal relations
49. Social competence
50. Professional training
51. Practical skills
52. Career Exploration

Career Goals

53. Business
54. Public administration
55. Professional
56. Scholar/scientist
57. Technology
58. Human services
59. Artistic
60. Undecided

College Experience

61. PQ Senior (persisted to the senior year)

Major (first or second, double majors counted twice)

62. Arts
63. Humanities (languages, English, philosophy, history)
64. Physical science (chemistry, physics, mathematics, engineering, geology)
65. Biology
66. Social science (sociology, economics, politics, psychology)
67. Business (accounting, business)
68. Double major (fulfilled degree requirements in two areas)
69. Broad curriculum (took one year of coursework in at least 6 of 9 areas)

Coursework (one year or more)

70. Biological science
71. Computer science/mathematics
72. Economics/political science
73. Foreign languages
74. Literature/history
75. Music/art
76. Philosophy/religion
77. Physical science
78. Psychology/sociology
79. Held internship
80. Held assistantship
81. Planned to go to graduate school
82. Had a career plan (from the senior questionnaire)

Note: Measures 69-82 came from a questionnaire completed by 70 percent of seniors in the middle of the fourth year.

Progress Toward Goals
(satisfactory progress, based on questionnaires of freshmen at the end of the first year)

83. Liberal education
84. Intellectual skills
85. Moral values
86. Social awareness
87. Creative talents
88. Physical development
89. Leadership training
90. Personal relations
91. Social competence
92. Professional training
93. Practical skills
94. Career exploration

Success Criteria

Significant Accomplishment (identified by the college)

95. Scientific (for example, coauthor of a scientific or technical paper)
96. Artistic (for example, successful sale of art/craft products)
97. Communication (for example, senior editor on a major college publication)
98. Physical (for example, consistent winner in individual sport)
99. Organizing (for example, leader in a student movement)
100. Other (on par with the above, but does not fit into any of the categories)
101. Accomplishment (recipient of any of the six above)

Leadership

102. Elected leader, position taken seriously at the college (for example, students council officer)
103. Appointed leader (for example, dormitory counselor)
104. Leadership (held either an elective or appointed position)

Scholarship

105. College honors (graduated cum laude)
106. Department honors (based on honors project or paper)
107. Scholarship (based on the previous two measures, recipient of either)
108. Most successful (college nomination, committee decision based on criteria determined by individual colleges)
109. Nominated by peers as most successful (3 or more nominations in senior year)
110. Graduated early
111. Accepted in Law/Medicine/Ph.D. program

Grade Point Averages over Four Years
(B average or higher)

112. GPA1
113. GPA2
114. GPA3
115. GPA4
116. CGPA (Cumulative four year grade average)

From the 21 possible AP subjects, 18 were used to define the following 6 groups:

AP Subject	*AP Area*	*Comparable Major*
American History Art History European History	117 History	History
English Literature	118 English	English
French Language French Literature German Literature Latin, Vergil Latin, Catullus-Horace Spanish Language Spanish Literature	119 Languages	Languages (any foreign language)
Calculus AB Calculus BC	120 Math	Math
Biology	121 Biology	Biology
Chemistry Physics B Physics C (Mechanics) Physics C (Electricity plus Magnetism)	122 Physical Science	Physical Science (chemistry or physics)

Variables Used to Define AP Groups:

123. AP students (1,115 students who submitted at least one AP grade)
124. 2+ credit (students who earned AP grades at the credit level in their colleges for two or more AP subjects)
125. AP high school (3 levels: no AP courses offered, 1-4 AP courses offered, 5 or more AP courses offered)
126. Mean AP grade (based on all grades submitted)
127. Number of AP grades submitted
128. AP Examinations taken in junior year of high school
129. Selectivity of college attended (Bucknell, Colgate, Williams, = 1; others = 0).

The Analyses

In analyzing these data we addressed three broad questions: Do the characteristics and college performance of AP students differ from their non-AP college peers? Do differences in

college performance, if any, persist after ability and achievement have been taken into consideration? Are there important differences among subgroups of AP students? We outline here briefly several methods that were used in these analyses. Further details are provided in succeeding sections and in technical notes as cited.

The first method of analysis involved preparing conventional profiles of the groups on preadmission measures, measures of college experiences, and measures of success in college. These profiles present the percent of each comparison group with various characteristics; for example, the percentage of women in the AP group versus the non-AP group.

In order to control for ability level, AP and non-AP students were matched in the following manner. Six measures that had been found earlier to be the best indicators of success in these colleges were used to develop a composite matching variable (see technical note 2). Thus SAT score, high school rank, follow-through, school reference, high school honors, and personal statement were used to predict AP membership for all freshmen. The predicted AP status, so derived, was used to match AP freshmen and non-AP freshmen within each college. Profiles of these matched groups were then compared as described above.

A variety of AP subgroups were examined—by sex, high school type, selectivity of college attended, number of AP grades submitted, AP subject area, and so on. The profiles for these subgroups included only selected variables. Since these various groups of AP students often differed widely in ability, it was necessary to take that into account in comparing their college performance. For this purpose we used a technique called residual analysis.

Residual analysis enabled us to compare the actual performance of the various groups with that predicted by preadmission measures of achievement. It works as follows. Using logistic regression, one predicts from, for example, school rank and test scores the probability of any given student graduating with academic honors. On this basis one can compare for any group the predicted and actual proportion of students graduating with honors. The question in these comparisons is whether or not students with a certain characteristic (for instance, those who submit three or more AP grades) perform at a level higher or lower than would be expected from their SAT scores and school rank. This particular mode of analysis was used extensively in the Personal Qualities Project and is described in more detail in Willingham and Breland (1982) and Willingham (1985).

The residual method is comparable in some ways to the matching method. Both are used to compare AP and non-AP students with control for ability level and possibly other measures of achievement. The matching technique compares the AP students with comparable non-AP students, while the residual method compares actual and predicted performance within the same group. The latter is very versatile with regard to definition of groups and ease of analysis once the necessary initial computations have been carried out.

5. AP STUDENTS AT ENTRY

In examining the college performance of Advanced Placement students, it is necessary to have some framework or basis for comparison. In this and the following section, the comparison is between students who did participate in the Advanced Placement Program and those who did not. In three subsequent sections we examine the performance of AP students by comparing one type of AP student with another (for example, students who took their AP work in public schools versus those who took AP courses in private secondary schools, students who submitted different numbers of AP grades or in different subject areas, and so on).

In examining the differences between AP and non-AP students at the time they enroll in college, we ask two types of questions. First, how do AP students compare with freshmen generally? Are they, as one would assume, typically more able? If so, to what extent and in what ways? The second and rather different question is how AP and non-AP students compare if one takes academic ability into account. Are there systematic differences between AP and non-AP students even when the two groups are matched on measures like school rank and SAT scores? This second question becomes particularly interesting in later sections when we examine how the AP students did in college.

Observed Differences

Background characteristics of AP and non-AP freshmen differed in several respects (see Appendix A, Table A-1 for details). To a small degree, women were overrepresented among the AP students, and minority students were underrepresented. There were more substantial differences associated with the type of secondary school attended. AP students were much more likely to come from large public rather than small public secondary schools. In fact, only 5 percent of the students in our sample who came from the small public schools (that is, schools with fewer than 100 graduates) submitted an AP grade. This is no great surprise since a large public school is much more likely than a small one to have the necessary personnel and other resources to support college-level course offerings.

Another obvious difference in the background of AP students was the extent to which their secondary school placed emphasis upon college preparation. For example, among private school graduates 27 percent submitted AP grades as compared to 19 percent of the students who came from the public secondary schools that sent no more than a third of their graduates on to college. This difference would undoubtedly have been larger were it not for the following. These nine colleges tend to attract less able students (compared to their average freshmen) from private schools,

but the freshmen they receive from public schools that send relatively few students to college are usually quite good students (see Willingham 1985, Table 5.5). In other words the more able private school graduates often go to even more selective colleges, while it is mainly the very able graduates from weak secondary schools who matriculate at these colleges.

These considerations make clear that one should be quite cautious in interpreting these data concerning secondary school background of AP and non-AP students because these students are not at all representative of the graduates of the various types of schools. That is to say, these data are likely representative of AP students at selective private colleges, but they are not necessarily representative of the AP students who have a particular type of background characteristic.

Just as these AP freshmen were more likely than their non-AP colleagues to come from college-oriented secondary schools, the AP students were also more likely to come from homes where the parents were highly educated or held prominent occupations. In fact, prominent parent occupations such as judge, surgeon, and company president were half again as likely among the AP freshmen as among the non-AP (12 percent vs. 8 percent). These differences in the home background of AP and non-AP students seem to be reflected in the way the students were engaged in the admissions process. The AP students were more likely to have come to the college campus for an interview (53 percent vs. 43 percent). They were also more likely to have been an early applicant (24 percent vs. 18 percent). Both of these differences suggest the more active involvement in selective admissions that frequently characterizes the upper-middle-class family.

Do AP students differ in their educational and career goals? To some degree, yes. The most obvious difference concerned the relative importance attached to liberal education (''read a lot, learn about the significant cultures of the world, and so on'') as opposed to professional training (''making the grades I need in order to get into a good school after I finish here, and so on''). AP students were more likely to consider the former very important (46 percent vs. 36 percent) and less likely to attach significance to the latter (42 percent vs. 49 percent). The AP students were also somewhat more likely to attach importance to learning objectives that are not strictly academic, especially activities involving leadership, creative talents, and moral development. On the other hand, they were somewhat less likely to attach importance to physical development.

The tentative career goals of AP and non-AP students reflected an intellectual leaning. The AP students were substantially more likely than the non-AP students to express interest in a scholarly or scientific career (13 percent vs. 7 percent). They were correspondingly less likely to be interested in business or human services (see Appendix A, Table A-2).

The most important question concerning differences between AP and non-AP freshmen at entry is their relative level of ability and achievement. On 12 independent measures of achievement in secondary school, the AP students were significantly higher than the non-AP students in all instances save one—athletic prowess (see Appendix A, Table A-3). The largest difference was in the percentage of AP and non-AP students who scored 600 or better on the SAT (57 percent vs. 26 percent). This was a consistent difference from college to college. In each of the nine institutions the average SAT score of the AP group was 30-50 points higher than that of the non-AP freshmen.

There was almost as much difference between AP and non-AP students in the percentage ranking in the top tenth of their secondary school class. As would be expected there was also a sizable difference in the proportion who won academic honors in secondary school (21 percent vs. 9 percent). But there were also consistent differences favoring the AP students in extracurricular achievement, strength of their school reference, and quality of the personal statement filed with their application for admission.

As a group, the AP students were also seen as substantially stronger applicants than the non-AP students by admissions staff. As Appendix A, Table A-3 indicates, their ratings consistently favored the AP group, sometimes significantly so. The AP group were more frequently judged to have had an outstanding admissions interview, were more frequently characterized as ''unusually mature,'' and their admissions folder was four times as likely to receive the relatively rare flag ''intellectual orientation'' (8 percent vs. 2 percent).

Table 2 summarizes the percentage of AP and non-AP students who scored high on six key preadmission achievement measures. These six measures are important because they represent different types of evidence that are considered in selective admissions. Furthermore, in earlier work, these six measures were found to be the best predictors of overall success in college (see Willingham 1985, chapter 5). Table 2 compares AP and non-AP students for all freshmen combined, but it is also important to know how much these two groups differ in individual colleges. The third and fourth columns of this table provide that comparison. Within individual colleges the difference between the AP and the non-AP students is about half to two-thirds as large as the difference for all freshmen combined. This is because the AP students tend to be more able, and they are more likely to enroll in the more selective institutions. The proportion of AP students among these nine entering freshman classes ranged from 7 to 46 percent.

The results indicate that there were substantial differences in the academic ability of AP and non-AP students and in various aspects of their academic and extracurricular achievement in secondary school. To what extent do those differences in ability and achievement account for other observed differences in AP and non-AP students? This brings us to the second basis for comparing these groups. Are there distinctive characteristics of AP students even after taking account of their generally superior ability in achievement?

Matched AP and Non-AP Freshmen

As described in Section 4 of this report, matched groups of AP and non-AP students were selected in order to compare the AP students with a group of similar ability. There are several bases on which these students could be matched. SAT score is one possibility. The SAT combined with school rank is another possibility. Since we were interested in different types of success in college, the preferred method of matching was to make the comparison groups as similar as possible on those preadmission measures that are known to be related to success in college generally. Analyses previously described in Willingham (1985) indicate that there are six such measures—those indicated in Table 2. The AP and non-AP groups differed by three-quarters of a standard deviation on the SAT, half a standard deviation on school rank and academic honors, and about one-quarter of a standard deviation on the other three measures. Properly weighted (see technical note 2), these six measures were used to create two matched groups: 932 AP students and 932 non-AP students. The resulting matched groups had almost identical means on all of these measures (see Appendix A, Table A-4). Since the matching was done within colleges, any arbitrary differences in standards of success from college to college were also controlled.

Table 2. Percentage of AP and Non-AP Freshmen with Various High Preadmission Qualifications—Overall and Within the Same College

High Qualification	*Percentage of All Freshmen*		*Percentage of Freshmen in Same College*	
	AP	*Non-AP*	*AP*	*Non-AP*
SAT (600 +)	57	26%	46	29%
School Rank (top decile)	57	35	50	38
Follow-Through (5)	21	17	20	16
School Reference (>4)	16	10	13	11
Personal Statement (>4)	13	9	12	9
Academic Honors (5)	21	9	17	11

Note: Columns 1 and 2 indicate the percentage of AP and Non-AP freshmen with the high qualifications indicated. Columns 3 and 4 show the same percentages computed within and averaged across individual colleges.

Differences between the AP and non-AP matched groups are shown in detail in Appendix A, Tables A-1, A-2, and A-3. As would be expected, the matched samples do not differ on any preadmission achievement measure. Further more, there were no significant differences between these matched groups on any of the ratings by admissions staff. In other words, when these matched groups entered college, the colleges saw them as equivalent on the several ratings they routinely use to evaluate applicants.

With respect to background characteristics, after matching there was no longer any differential representation of minority students, though the sex difference favoring women increased. Also, taking account of ability and achievement resulted in similar but somewhat larger differences between AP and non-AP students with respect to school background. Private school graduates had been more heavily represented in the total AP group despite the somewhat lower qualifications of these students. On the other hand, matching almost completely erased the association between home background and AP status.

Matching for ability and achievement did not change at all the tendency for AP students to come for a campus interview. Matching also did not change the tendency of AP students to view liberal education and leadership training as very important educational goals. On the other hand, when ability and achievement were taken into account, AP and non-AP students did not differ in the importance they attached to professional training and physical development.

To summarize, this comparison of AP and non-AP freshmen indicates that the AP group differed significantly with respect to their home and school background. There were small but significant differences in their educational and career goals. Most important, the AP group was substantially superior with respect to academic ability and various types of achievement in secondary school. Comparison of the matched groups indicated some important differences beween AP and non-AP students even after taking account of their levels of ability and achievement. The AP students were more often women, were more likely to come from a school background where AP courses were available, were more actively engaged in the admissions process, attached more importance to a liberal view of higher education, and were somewhat more likely to plan a scholarly or professional career as opposed to one in business or human services.

6. COLLEGE EXPERIENCE AND ACHIEVEMENT

The main emphasis of the Advanced Placement Program is to strengthen the secondary school program of students who are ready for college-level work and to provide an administrative mechanism for moving those students ahead wherever appropriate in the freshman year of college. Therefore, follow-up studies of AP students have typically focused on their performance in subsequent courses in order to determine whether their advanced placement in college was appropriate. This study does not examine performance in individual subjects because the original Personal Qualities Project was not designed with that purpose in mind, and the data base does not include the information necessary for that type of analysis. Our purpose is rather to examine the students' overall college experience and several important aspects of their performance through four years. In this section we examine the AP students' course of study, their subjective sense of educational progress, some objective measures of their attainment, the grades they earned, and various marks of their success in college.

Course of Study

There was a substantial difference in the pattern of college majors for AP and non-AP students. About half again as

many AP as non-AP students majored in the natural sciences. AP students were also more inclined to major in the humanities. On the other hand, they were significantly less likely to major in social science or business. A similar pattern obtained in the matched groups of AP and non-AP students, though such differences were considerably muted when ability differences were controlled.

This pattern indicates that the AP students tend to migrate toward majors that are typically more difficult in these institutions (see Willingham 1985, Chapter 4 for more data on this point). AP students were also somewhat more likely than non-AP students to have a double major—another indication of a willingness to take on a more demanding program.

These differences in the pattern of majors were mirrored in the pattern of coursework (see Appendix A, Table A-5). AP students more frequently took coursework in the natural sciences; non-AP students more frequently took a year or more coursework in the social sciences. Again, those differences were smaller when AP students were compared with non-AP students at the same level of academic ability. But there were two broad areas—computer science/mathematics and literature/history—in which the AP students were less likely to take a year or more coursework than were non-AP students of similar ability. The reason for these small but significant differences (6 percent) is not clear. With all AP students lumped together, it is difficult to draw conclusions as to whether students placed ahead in a subject are more or less likely to take additional coursework in that area. Much depends upon which AP course the student has taken. We get to that analysis in Section 9 of this report.

There is another interesting question concerning the course selection habits of AP and non-AP students. One might reasonably speculate that participation in the Advanced Placement Program in secondary school often signifies a greater academic interest and commitment. That orientation might be reflected not only in the greater importance AP students tend to ascribe to liberal education but possibly also in a tendency to take more diverse coursework in college. That is a good theory but it turns out not to be the case. Students taking a broad array of courses were almost equally represented among AP and non-AP students. One possible explanation is related to the fact that the AP students were more likely to have a specific career plan than were the matched non-AP students. Such plans may have tended to focus the AP students' academic energies and offset an otherwise natural inclination toward diverse intellectual interests.

We also examined the academically related work experience of AP and non-AP students. There was no significant difference with respect to internships, but the AP students were more likely to hold assistantships. They were also more likely to have plans to obtain a doctoral degree. Neither difference was significant between the matched groups.

The Students' Sense of Progress

One view of the Advanced Placement Program is that it serves to improve the articulation of the students' educational program from secondary to higher education—a more orderly continuity of learning, so to speak. Are AP students more likely to offer positive assessments of their progress in the freshman year? The Personal Qualities data file included student ratings of their progress toward 12 educational goals (see Appendix B) at the end of their first year. For each goal the students simply indicated whether they were satisfied, not sure of, or dissatisfied with their progress at that point.

There were not large differences in the percentage of AP and non-AP students who voiced satisfaction with progress toward different educational goals. The percentage of satisfactory ratings did, however, tend to favor the AP students and that was more true in the matched samples than in the unmatched groups (see Appendix A, Table A-6). Comparing the matched groups, there was no significant difference in 8 of the 12 goals. On the other four, ratings of satisfactory progress ran somewhat higher for AP than for matched non-AP students. Two were intellectual goals: improving social awareness and developing moral values. A third concerned developing social competence and the fourth was professional training (''making the grades I need to get into a good school after I finish here'').

It is difficult to interpret these data. The absence of any very clear difference between AP and non-AP students may be due to a cancelling out of two contradictory influences. It was found that students who do well are more likely to report good progress (Willingham 1985). Since these AP students tended to do well academically, one would expect more satisfactory ratings of progress on that account. On the other hand, results reported in Willingham and Breland (1982) indicated that students who were particularly successful in high school were often less likely to report satisfactory progress in college (presumably because the going was tougher). Also Casserly's early work (1968) revealed that AP students often express some dissatisfaction with their early academic experience in college because in their view it doesn't always come up to the standards of their AP experience in secondary school. The more important question, of course, is whether the students attain their goals and in what ways they earn recognition from the college.

Measures of Attainment

An important aspect of progress is the extent to which students attain degrees and move through the educational system. In this study we have available three measures of attainment that are particularly important: persistence to the senior year, early graduation, and admission to a selective program of advanced study. The AP students excelled on all three (see Appendix A, Table A-7).

There was a substantial difference in persistence rate. Among the non-AP students, 26 percent had dropped out by the fourth year; among the AP students, 15 percent dropped out. That difference is largely if not totally associated with ability level and college attended. The matched groups did not differ significantly in rate of persistence.

In many, if not most, instances, advanced placement

carries with it credit toward the college degree. Does this mean that the AP students tend to graduate early? If so, some colleges may view this as a mixed blessing at a time when tuition-paying students are in short supply. The conventional wisdom has been that relatively few students use advanced placement credits in order to graduate early. That was the experience reported by Duke University, for example, (Cahow, et al. 1979), but there appears to be little published data on the question.

In these nine colleges very few students graduated early. More AP students than non-AP students did so; the difference was statistically significant but quite small (3 percent vs. 1 percent). Since the matched groups showed the same discrepancy in early graduation rates, the difference is likely associated with AP students receiving the credit, not with their being academically superior. As we shall later see, that difference was larger among students who submitted several creditworthy AP grades.

Another mark of educational attainment is selective admission to the next level of study. From these students we inquired only about admission to highly selective programs (Ph.D., law, and medicine). The colleges felt that, so restricted, reliable information could be obtained as of June of the senior year. Presumably more of these students enrolled in such programs later. As of that time, 11 percent of all seniors had been accepted in such a program of advanced study. The rate of enrollment among AP students was almost twice as high as that of the non-AP students (17 percent vs. 9 percent). There was a somewhat smaller but still statistically significant difference between the matched groups.

Note that this difference may be because AP students are more inclined to apply to such programs of advanced study, more likely to be accepted, or both. Plans for postbaccalaureate study do play a role here. AP freshmen were more likely than non-AP freshmen to state plans for advanced study (44 percent vs. 35 percent). When such plans were held constant, the AP and non-AP students did not differ significantly in rate of acceptance to advanced study. It is possible, of course, that a strong academic program in secondary school encourages students along that path.

Grades Earned

Considering that the AP students were a superior group at entry, it is no surprise that they earned significantly higher freshman grades than did the non-AP students (2.97 vs. 2.65). The AP group also outperformed the non-AP group of matched academic ability (2.96 vs. 2.81). These differences are consistent with data cited in the review of earlier studies. The differences were also consistent from college to college in this study. In all nine colleges the average freshman GPA was higher for AP than for non-AP students. Actual freshman grade average for the AP students was higher than predicted in eight of nine institutions.

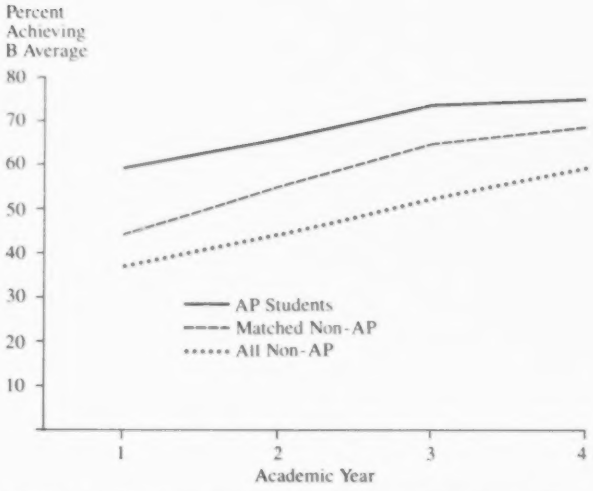

Figure 2. Percentage of AP and Non-AP Students Who Achieved a B Average in Coursework in Each Academic Year

It is typically reported that AP students make higher grades than other freshmen. Does this superior performance of the AP students last through four years of college, or does it simply reflect a momentary advantage due to the rigorous coursework recently completed? It appears to be a lasting difference. The cumulative four-year grade average of the AP students was a quarter of a letter grade higher than that of non-AP students (3.13 vs. 2.88). The AP students also had a higher four-year average than did their matched non-AP counterparts (3.12 vs. 3.02). Again this pattern was fairly consistent across institutions. In each college save one the AP students made higher four-year GPAs than did the non-AP students.

Figure 2 tells the story year by year. A substantially larger proportion of the AP freshmen made a B average or higher than did the non-AP freshmen (59 percent vs. 37 percent). The proportion of non-AP freshmen earning B averages was higher when that group was matched in ability with the AP students but still considerably lower than the AP group (59 percent vs. 44 percent). As Figure 2 shows, that difference persisted (statistically significant) through four years. It does appear that the superior performance of the AP students tails off somewhat in the fourth year. Is that due to some fading of the AP advantage? Possibly, but there appear to be rival hypotheses that may be more plausible. We have to come back to this question in the next section because it requires some examination of the performance of different groups of AP students.

Marks of Success

The Personal Qualities Project gave considerable attention to identifying and measuring different types of success in college (see Willingham 1985, Chapter 4). The nine cooper-

ating colleges devoted a great deal of effort to documenting the accumulated achievement record of their students through four years. This involved not only the analysis of grade averages but also the identification of groups of students successful in three broad areas: significant accomplishments, leadership, and scholarship (as described in Section 3). Two or more types of success were identified in each of these areas, and various types of relevant evidence were collected by the colleges in order to identify which students deserved to be included in each success group.

In the original study, 25 percent of all seniors were cited for one of six types of significant accomplishment; 35 percent had a leadership role in the college (important elected office or appointed position); and 30 percent qualified as scholars by virtue of graduating cum laude or with departmental honors. Many students qualified in more than one of these three broad types of success, but overall there was only a moderate degree of overlap among the three.

The nine colleges also created a fourth success group—those students whom they considered "most successful" overall in meeting the educational objectives of the institution. The number of students so identified varied from college to college; overall one senior in five was nominated most successful. Analysis of that success group indicated that the colleges had placed almost equal weight on accomplishments, leadership, and scholarship in making their choices.

The incidence of these four types of success for the AP and non-AP students is shown in Figure 3 (see Appendix A, Table A-7 for additional detail). Note first that in all four success categories the proportion successful is greater in the AP group than in the non-AP group. Furthermore, in three of the four categories (excepting accomplishments) the incidence of success is significantly greater among the AP students than in the matched sample of non-AP students.

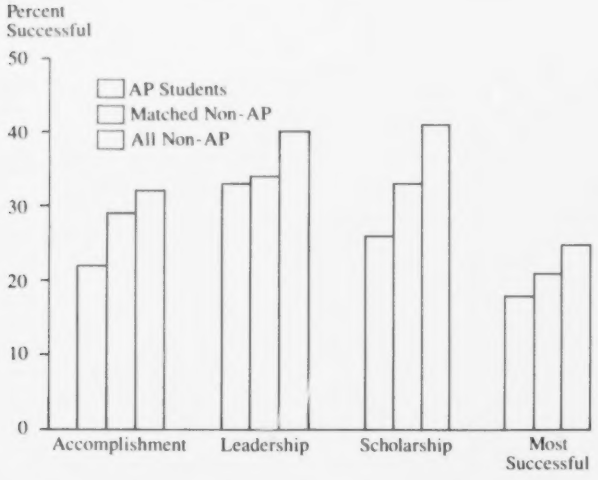

Figure 3. Percentage of AP and Non-AP Students Who Were Notably Successful on Four Criteria

Looking now at each type of success measure, the AP students did well in special accomplishments. They were cited significantly more often than the non-AP students for accomplishment in science, art, communication, organizing activities, and other independent accomplishments. The non-AP students had a small but insignificant edge in physical accomplishments (largely athletic). These differences in accomplishments were accounted for mostly by superior qualifications of the AP group at entry. While the AP group easily outdid the non-AP group (32 percent vs. 22 percent), there was very little difference between the matched groups in the percent cited for significant accomplishments.

The AP students were more frequently identified as leaders and the difference was almost as large in the matched groups. It is important to clarify, however, that the leadership superiority of the AP group was entirely owing to their having been appointed more frequently to important positions by the college. The AP group was not more likely to hold offices elected by students. Earlier analyses of these two types of leadership revealed that appointed positions are more associated with academic reputation while elected offices seem influenced by athletic prowess (see Willingham 1985, Chapter 4).

These results suggest that AP students may have been more successful than predicted in leadership only because they excelled in scholarship. To check on that possibility we examined more carefully the relationship of AP status to success in leadership. It did turn out that AP students were not likely to excel beyond expectations in leadership if one takes account of their high cumulative grade average (see technical note 3).

The largest difference between the AP and the non-AP students among these several types of success is clearly in the area of scholarship. While 26 percent of the non-AP students graduated with honors, 41 percent of the AP group were so recognized. There was a smaller but still substantial difference between the matched groups in this regard. Proportionately, the superiority of the AP group over the matched non-AP group was larger in the case of departmental honors (19 percent vs. 14 percent) than in the case of college honors (35 percent vs. 30 percent) (see technical note 4). Again, this result suggests a more scholarly orientation of AP students. While *college honors* was here defined solely in terms of the cumulative GPA, *departmental honors* signified successful completion of a meritorious senior thesis.

The results for "most successful" nominations were similar to our findings in the case of leadership. The AP group was nominated "most successful" more often than the non-AP group. Part of that superior record was associated with the AP students' more impressive record of achievement in secondary school, but even taking that into account, the AP students won more nominations as "most successful" in college. Finally, it appears that the over-achievement of the AP group on this overall measure was owing primarily to their tendency to overachieve in scholarship (see technical note 3).

These were the main findings regarding the experience and performance of the total AP group through four years of college. The AP students tended to take on a demanding course of study, and very few graduated early. Following graduation, substantially more were admitted to selective programs of advanced study than was true of their non-AP classmates. Some but not all of that difference was accounted for by the superior academic ability of the AP students (that is, school rank and test scores).

The AP students made much better freshman grades than non-AP students—even better than a matched group of non-AP students. That difference also showed up in grades earned in the sophomore, junior, and senior years. The AP students won recognition more frequently than the non-AP students for leadership and accomplishments, as well as scholarship. These differences were partly but not fully accounted for by a superior record of similar achievements of the AP students at entry. The AP group was more often selected "most successful" by their college than were non-AP students matched on several types of achievement in high school. It appears that the reason the AP students tended to excel beyond expectations in areas other than scholarship was that their overachievement in earning good grades made their inclusion in other success groups more likely. Thus it is true that the AP group was superior from several points of view, but the dominant theme was superior scholarship.

7. IMPORTANT AP SUBGROUPS

All results reported up to now have referred to the total group of AP students and how they compared with their non-AP classmates. While we have seen that the AP students are a generally superior group, they are certainly not all the same. In order to better understand this group and their college performance, it is useful to compare subgroups of AP students. In this section we examine the following important subgroups: AP men and women, AP students at more- and less-selective colleges, and AP students with different school backgrounds.

Selected measures were analyzed for each of these subgroups: Five critical background characteristics, six measures of school achievement, persistence to the senior year of college, and five measures of success in college. In addition to comparing the actual performance of these various subgroups of AP students, we wanted also to evaluate how well each group performed in light of its ability level. It was not practical to match the subgroups with non-AP students of similar ability, but we were able to make the comparison in another way.

There was available from the earlier study (see Willingham 1985, Chapter 5) a set of predictions for each student—predictions of the probability that a given student would graduate with honors, would be judged most successful by his or her college, and would be accepted for advanced study by June of the senior year (see technical note 5). Therefore, by comparing the predictions with the actual outcome, it was possible to determine whether the various groups of AP students performed above or below expectations based upon their qualifications at the time they entered college. In Section 4 we called this a residual analysis, that is, the performance differences left over after accounting for differences between groups on the most effective predictors. The main findings are discussed in the following sections. Consult Appendix A, Tables A-8 and A-9 for detailed results.

Sex and College Selectivity

Men and women are natural AP subgroups to examine, and we did find some interesting differences. The men were somewhat more likely to come from private schools and a larger percentage had SAT scores above 600 (62 percent vs. 53 percent). The women were somewhat more likely to come from large public schools, and a larger percentage were in the top 10 percent of their secondary school class (64 percent vs. 49 percent.) There was a substantial sex difference in the college major of these two groups of AP students. Men leaned to natural science (39 percent vs. 25 percent). Women leaned to the humanities (37 percent vs. 28 percent). In earlier work we found that humanities majors and women were more likely to attach importance to liberal education. Thus it is consistent to find here that the AP women more often than men rated that goal as very important (51 percent vs. 41 percent).

Significant sex differences in the performance of AP men and women over four years are illustrated in Figure 4. In one sense the performance of the two groups was similar. On each of the criteria indicated in Figure 4—graduating with honors, being nominated most successful by the college, or being admitted by a selective program of advanced study—both men and women AP students performed at a higher level than was characteristic of their class as a whole. In the

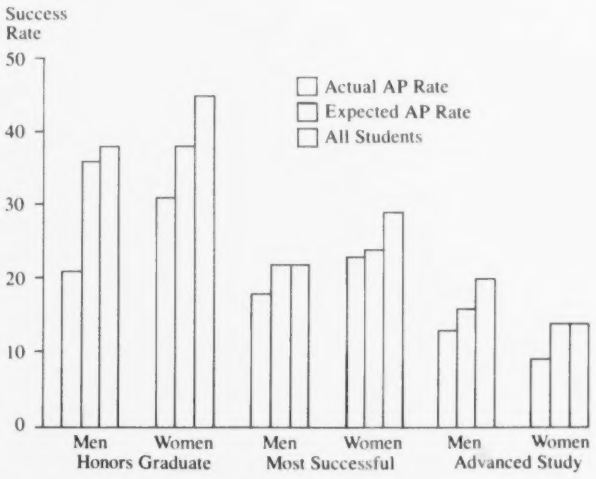

Figure 4. College Achievement of Men and Women AP Students

case of scholarship, that difference was quite substantial for both groups.

The different pattern for men and women shows up in the comparison of predicted versus actual performance. The women were significantly more likely to graduate with honors than would be predicted on the basis of their school rank and test scores (45 percent vs. 38 percent). On the other hand, the percentage of AP men graduating with honors was at about the level predicted. What one needs to know in interpreting these data is that among seniors generally at these colleges, the men tended to underachieve scholastically and the women tended to overachieve. So we do have a consistent pattern. Both the AP men and the AP women tended to do better than their non-AP counterparts. For the AP men, this meant coming up to the expected level instead of underachieving. For AP women, it meant overachieving even more than the women in these colleges normally did.

The pattern of sex differences for the "most successful" criterion was generally similar. The men achieved at the level expected on the basis of their preadmission qualifications. The preadmission qualifications of the women were somewhat higher. The actual proportion of AP women judged "most successful" was higher still than would have been expected on the basis of those qualifications. The situation tended to reverse with respect to which students were admitted to advanced study. The percentage of women in this success group was at the level expected on the basis of school rank, SAT score, and graduate intentions. The men's rate of admission to such programs was significantly higher than would be expected on the basis of those indicators.

AP students who attended the more-selective (Bucknell, Colgate, Williams) as opposed to the less-selective institutions (Hartwick, Kalamazoo, Kenyon, Occidental, Ohio Wesleyan, Richmond) were in some respects quite different and in other respects quite similar. As one would expect, preadmission qualifications of the AP freshmen in the more-selective institutions were on the average substantially higher. In the more-selective institutions there were many more students in the top 10 percent of their secondary school class (64 percent vs. 47 percent) and more students with SAT scores above 600 (73 percent vs. 37 percent). There were also significant, though not as large, differences in other preadmission measures. In the more-selective colleges the proportion of AP freshmen who had scored high on academic honors, productive follow-through in extracurricular activities, and the personal statement were about half again as frequent as in the less-selective colleges. Even more apparent was the difference in the number of AP students with highly laudatory school references at the more- and less-selective colleges (22 percent vs. 9 percent).

Another significant difference was the number of AP students who dropped out before the senior year in the less- and more-selective colleges (23 percent vs. 8 percent). This difference is deceptive, however, because the overall dropout rate for all students in the more-selective colleges was substantially lower than for all students in the less-selective institutions. Taking account of that gives a different picture. In both types of institutions the AP students had a somewhat lower dropout rate than was true of their class, and in fact, in the less-selective colleges it was significantly lower (23 percent vs. 29 percent).

The scholastic performance of the AP students was also quite similar in the more- and less-selective colleges. In both groups of institutions almost three AP students in five maintained a B average in the first year and about two AP students in five graduated with honors. Performance of AP students in the more- and less-selective colleges was also comparable with respect to predicted levels. In both types of institutions the AP students were significantly higher than expected in scholarship. Also in both types of institutions the AP students performed slightly higher than predicted (though not significantly so) with respect to the number of students nominated most successful and the number of students admitted to advanced study.

School Background

Among this AP group slightly less than three students in ten came from private schools (see technical note 6). There were some substantial differences among the AP students from public versus private schools. Even though the private school graduates had more highly educated parents, they scored considerably lower on school rank and on the SAT. Public school AP students were more often in the top 10 percent of their class than were private school AP students (67 percent vs. 29 percent); also they more often scored 600 or higher on the SAT (61 percent vs. 49 percent). On the other hand, references for the private school students appeared to be just as strong as were the references for the public school students. Even more interesting is the fact that the personal statements of the AP students from private schools were much more frequently considered outstanding in blind ratings by research staff (18 percent vs. 10 percent for public school). In other words, the comparison of the AP students from public and private schools reveals a quite different pattern depending upon whether one looks at the objective measures of academic achievement (that is, rank and test scores) or the more subjective narrative material represented by school references and the personal statement of the student. The private school students' relatively higher scores on the latter measures is not readily explained by superior achievement on other measures. The public and private school graduates got essentially the same average ratings for academic honors and outstanding extracurricular achievement (follow-through). It is possible that the private school graduates and their mentors devote more attention to putting the applicants' best foot forward in the school reference and the personal statement.

Another substantial difference between the AP students from public and private schools was the choice of major. Public school graduates were much more likely to major in the natural sciences, while the private school students were more heavily represented in the humanities. This is consistent with analyses reported in Willingham (1985) which

indicated that students with higher academic qualifications tended to gravitate toward the sciences.

It was also found, however, that in the upper division the grading standards of these colleges tended to be somewhat tougher in the natural sciences than in other academic areas. The AP students from public schools started off with better grades than their private school classmates (62 percent vs. 52 percent with a B average). But three years later, the proportion of AP students graduating with honors was about the same regardless of type of secondary school attended. Part of that catching up of the private school students appeared to be related to the public school graduates having been overrepresented in majors with stiff grading standards.

But there was another factor operating as well. There was some difference in the pattern of graduation honors received by public and private school graduates. College honors that depended solely on grade-point average were won more frequently by the public school students (37 percent vs. 33 percent), while departmental honors, which were based upon a senior thesis, were more frequently won by the private school students (19 percent vs. 15 percent). These differences are not large, but they do suggest the possibility that private school graduates are more inclined to take on discretionary academic projects that involve working closely with teachers. These results indicate that there are several significant interactions between school background of AP students and their performance in college. Note however that these effects are not associated especially with AP students. In large part the public-private differences here cited tended to hold for non-AP students also.

Controlling for the School AP Program

In Section 6 we saw considerable evidence of the superior performance of AP students in college. A good part of this superior performance was owing to these students' superiority at entry. But that is clearly not the full story. That superior performance persisted to some extent even in comparison to a matched group of non-AP students of similar ability and record of prior accomplishment. Matching within colleges also guarded against the possibility that AP students were overrepresented in colleges where success rates or grade scales may have been arbitrarily higher.

That earlier analysis did not take account (nor evidently has any previous study) of possible extraneous factors resulting from differences in secondary school programs. Notice that some of the matched non-AP students undoubtedly came from schools that had no AP program. On average, those might be expected to be schools with weaker programs overall. Is it possible that the superior performance of AP over the non-AP matched students is simply because the AP students came more often from stronger secondary schools, that is, not actually because of AP program participation per se?

Clearly, it is important to control for AP opportunity at the secondary level—but how? It was not possible to match within secondary schools because a great many of the schools were represented by only one student. The procedure adopted was one that takes advantage of the mode of analysis just described with respect to sex differences and different types of colleges. Namely, we identified schools at different levels of AP participation and then compared the predicted (based

Table 3. Preadmission Qualifications, Predicted Grades, and Actual Grades for AP and Non-AP Freshmen by Level of Secondary School Participation in the AP Program

				Freshman Grade Average		
Group	*N*	*SAT*	*School Rank*	*Predicted (P)*	*Actual (A)*	*Difference A–P*
Non-AP Students						
School AP Participation†						
None	1119	551	54.8	2.80	2.70	–.10*
Light	1322	540	50.7	2.69	2.68	–.01
Heavy	1146	533	44.8	2.53	2.57	.04*
AP Students						
School AP Participation†						
None	45	604	56.3	2.90	2.95	.05
Light	473	597	56.7	2.92	2.97	.07*
Heavy	582	613	53.4	2.87	2.98	.11*
Total x	4687	556	51.2	2.73	2.73	.00
S.D.		83	10.2	.36	.63	.51

*Predicted and actual grade averages differed significantly—$p < .05$. Grade predictions were based on SAT scores and school rank, the latter standardized with mean of 50 and standard deviation of 10.

†Light AP participation was defined here as offering 1 to 4 AP courses; heavy as 5 or more.

in this case on linear regression) and actual college performance of AP students coming from those secondary schools.

For the purposes of this analysis, we distinguished three types of secondary schools: Non-AP schools, light AP schools, and heavy AP schools. These were defined in terms of the number of AP subjects offered by the school (that is, 0, 1-4, or 5 + ; see Section 4 for a more detailed description). Selected profiles for AP students coming from the light and heavy AP schools are shown in Appendix A, Table A-9.

For purposes of this discussion the critical information on academic qualifications and performance in college is shown in Table 3. We have also included in this table corresponding information for non-AP students who went to non-AP secondary schools or schools that were light or heavy AP participants. First, it is clear from Table 3 that all of the non-AP students did not come from non-AP schools. Since substantial numbers of the non-AP students came from light and heavy AP secondary schools, it is possible to disentangle to some extent school origin and AP participation. There are even a few AP students from non-AP schools. They may have studied for the examinations independently, or the school may actually have been an AP participant in 1979 but had too few AP students to meet our criterion of an AP school.

What are the rival hypotheses that this table might help to eliminate? First, one might speculate that the superior college performance of AP students (in relation to expectation) is associated mainly with the students' participation in the AP Program. If that is the case, one would expect the actual freshman grade average of the three AP groups to be uniformly higher than predicted, but that no such relationship would obtain for the non-AP students.

Alternatively, one might hypothesize that the AP students tend to do better because they more frequently come from strong secondary schools that are more likely to have AP programs. If that were the case, the table would show a strong pattern of overachievement for students from heavy AP schools, underachievement by students from schools with little or no AP participation, and no evident difference in that pattern for AP and non-AP students.

Actually, the table shows evidence of both patterns. Looking at the last column, one sees a progressive shift from underachievement on line 1 to overachievement on line 6. In general, the AP students tended to overachieve compared to the non-AP students, but within both groups there is a progressive shift from underachievement to overachievement as one moves from schools with no AP participation to schools with heavy AP participation. The table gives the impression that AP students do better than expected in college partly because they have participated in the AP Program and partly because they have attended a stronger secondary school. However, the causal relationship implied here is not necessarily justified, as other factors such as differential motivation could account for differences in high school performance was well as college success.

The results described in this section boil down to two main findings. One is that differences between AP and non-AP students tended to generalize quite well across major classifications of students. Put another way, there were differences among AP students according to sex, public/private secondary schools, and more-/less-selective colleges but the differences were much the same as those that characterize those subgroups generally.

The second finding is that the "AP effect" (that is, achievement beyond expectation in college) has two components: one associated with the strength of the school AP Program and another with whether the student chose to exercise the AP option. Thus the strong showing of AP students cannot be attributed simply to the fact that these students have attended stronger schools. Within schools at the same level of AP participation, students who took an AP course did better in college than those who did not. On the other hand, there was also evidence of a school effect: non-AP students in schools with extensive AP programs did better in college than would be predicted on the basis of SAT scores and school rank. These data suggest that the availability of strong educational programs and individual initiative are both important.

8. AP GRADES—QUALITY AND QUANTITY

Taking an Advanced Placement course in secondary school does not necessarily qualify a student to be placed ahead in that subject in college. Satisfactory performance on the AP Examination is a second critical requirement. While grades on the examinations range from 1 to 5, it is only a grade of 3 or higher that is termed "qualified" and is considered to represent satisfactory college performance. A grade of 2 is considered marginal.

Actual credit policies are determined by individual institutions on the basis of their experience. Grades required for advanced placement and/or credit vary among institutions and often among subject areas within an institution. Whether an institution accepts the AP Program's recommendation and awards credit for all grades of 3 or higher or sets some other grade requirement based upon local experience, it is clear that the examination grade is a consequential consideration in evaluating the college performance of AP students.

Needless to say, the number of grades submitted is also consequential, since the more freshman coursework a student is able to avoid repeating, the more rapidly he or she moves into more advanced college work. In this section we examine the qualitative and quantitative aspects of the AP grade record. To what extent are AP grade level and number of AP grades helpful in anticipating performance of AP students in college?

AP Grade Level

For purposes of this analysis we computed an average AP grade for all AP students. The total AP group was then divided into three subgroups:

1. High AP Performers: 165 students whose average AP grade was higher than 4
2. Middle AP Performers: 686 students whose AP average was in the range of 3 to 4
3. Low AP Performers: 264 students whose average AP grade was less than 3

Roughly speaking the first two groups who made grades of 3 or better on the average represent the "successful" AP students who performed at the level recommended for credit and likely received some modified educational treatment in college. They constituted 76 percent of the AP group.

There were a number of striking differences between the high and low AP performers in secondary school (that is, those with AP grades below 3 or above 4). The low AP performers tended to look generally like students who did not submit AP grades. The high performers clearly showed more evidence of an intellectual background; that is, they were substantially more likely to have highly educated parents and to consider liberal education to be a very important goal.

There were even greater differences between the low and high AP performers with respect to measures of academic achievement in secondary school. Among the low performers 45 percent were in the top 10 percent of their class. The corresponding figure among high AP performers was 73 percent. More than twice as many high AP performers scored above 600 on the SAT as compared with the low AP performers (83 percent vs. 34 percent). Perhaps the most dramatic difference between students who made low AP grades and those who made high AP grades was in the type of honors they received in secondary school. The high AP performers were four times as likely as the low AP performers to receive academic honors. On the other hand, the high AP performers were no more likely to show evidence of outstanding extracurricular accomplishment than were the low AP performers.

College course of study also reflected a clear difference between the students who had done very well and those who had done not so well in their AP secondary courses. Earlier it was suggested that the AP students generally were somewhat more oriented toward the humanities than the average college student. That appears to be doubly true of students who did very well in AP work at the school level. The high performers were twice as likely as the low performers to major in humanities. This is consistent with the greater importance this group attached to liberal education.

Another sharp difference between the high and low AP performers was the grades they earned in college. The high group was twice as likely to make a B average or higher in the freshman year. Of course, it would be expected that the high AP performers would do well in college because, as we have seen, they were much more academically able. Does the predicted and actual academic performance of AP students in college vary according to the level of the AP grade submitted? Figure 5 shows for those groups of students who earned AP grades of 1, 2, 3, 4, or 5 the actual freshman average earned and the average predicted on the basis of school rank and SAT scores.

Figure 5 illustrates three important facts about the relationship between AP grade level and academic performance in the freshman year. First, the freshman grades of AP students varied considerably depending upon the level of the AP grade submitted. Students who had submitted AP grades of 1 had an average freshman grade-point average of 2.57. Students who submitted AP grades of 5 had an average freshman GPA of 3.26—well over a standard deviation difference. Second, there was a general tendency for the AP students to make higher freshman grades than predicted. This overachievement was true for students who had submitted high AP grades but not for those who had submitted low AP grades.

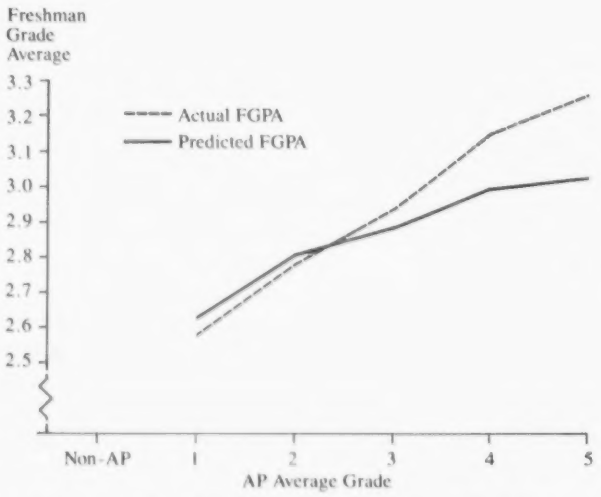

Figure 5. Predicted and Actual Freshman Grade for Non-AP and AP Students Who Earned Low and High AP Grades

The third observation stems directly from the previous two—there is a clear difference in the performance of students who submitted AP grades of 1 and 2 as opposed to students who submit grades of 3 or better. The freshman GPAs of AP students submitting grades lower than 3 were, on average, generally similar to those of non-AP students, and their academic performance was at about the level predicted. But as Figure 5 indicates, the predicted and actual performance of AP students begins to pull apart with AP grades of 3 or higher. Students who submitted AP grades of 4 or 5 earned substantially higher freshman grades than predicted on the basis of school rank and test scores.

The fact that the curves cross in Figure 5 between an AP grade of 2 and 3 has other significance. As we noted earlier, the AP Program makes an effort to pitch the grading standard so that a grade of 3 clearly represents satisfactory college-level work in a subject, and it is that grade that is

recommended for credit. Figure 5 indicates that, correspondingly, it is the AP grade of 3 or higher that shows promise of generally superior academic performance in college, that is, the freshman averages of students with AP grades of 3 or higher exceed the level predicted on the basis of school rank and SAT scores. These results suggest that, overall, the program's standards and recommendations are appropriately pitched.

But institutional standards vary. Would not the results of Figure 5 differ in more- and less-selective colleges? Would students with AP grades of 2 tend to have better grades in less-selective colleges where the competition is less severe? Perhaps, though not necessarily in relation to expectation because both actual and predicted grades are scaled to the ability of the students in the class. We examined the curves of Figure 5 in the three more-selective colleges (Bucknell, Colgate, Williams) and separately in the six remaining less-selective colleges. The results of the two analyses were almost exactly parallel: students with low AP grades looked more like non-AP students in both groups of colleges. Students with high AP grades far outperformed expectations in each group of colleges, and the curves crossed in the same region of the AP scale—approximately 2.0 in less-selective colleges and 2.5 in the more-selective. This result indicates that there is possibly a small-scale shift in the direction hypothesized, but that generally AP grade level has similar implications regarding overachievement in more- and less-selective colleges.

Results for other long-term criteria of college success were generally consistent with the results at the end of the freshman year. Among students who submitted AP grades of less than 3, three in ten graduated from college with academic honors, which was almost exactly the proportion predicted on the basis of school rank and test scores. On the other hand, students who had submitted AP grades higher than 4 were twice as likely to graduate with academic honors and the proportion doing so was significantly higher than predicted on the basis of school rank and test scores (61 percent vs. 48 percent). There was a similar trend though smaller differences with respect to the proportions of students designated as most successful overall by their college.

Number of Grades Submitted

An important aspect of the potential impact of the Advanced Placement Program on a student's college curriculum is the fact that a variety of Advanced Placement courses are available at the secondary level. Students can take more than one AP course and many do. Are there critical differences between students who take one AP course and those who take several? Does the appearance of several AP grades on a transcript signify a more able student who is likely to perform better in college? What about the four-year record of the student who may have saved a term or more through Advanced Placement work at the secondary level? Did many such students graduate early? We turn now to such questions.

In this group of 4,814 freshmen, 606 (13 percent) submitted one AP grade, 288 (6 percent) submitted two, and 221 (5 percent) submitted three or more AP grades. While women tended to be more heavily represented among AP students generally, males were somewhat more likely to be multiple AP participants. That was the only significant background difference we noted in comparing single versus multiple AP grade submitters.

There was, however, a significant difference as to academic orientation. Those who submitted multiple AP grades tended to attach more importance to liberal education—despite male students' being less frequently inclined in that direction. That students who took multiple AP courses had a somewhat broader educational perspective was suggested also by another fact. The students who submitted three or more AP grades were more than twice as likely (37 percent vs. 17 percent) to take diverse coursework in college, that is, the equivalent of a year's work in at least six different academic areas. Again, this pattern ran counter to the finding that the multiple AP participants were more likely to be males and more likely to be majoring in natural science where such diverse coursework was generally less common.

Students who submitted multiple AP grades tended to be superior academic achievers in secondary school compared to those who submitted only one AP grade. They had higher school rank and test scores, though not dramatically so. These measures of academic ability tended to be more closely related to the quality than to the quantity of AP grades submitted (see appendix A, Tables A-10 and A-11). Academic honors in high school were also clearly more related to quality than to quantity of AP grades submitted. On the other hand, the strength of the school reference was just as closely related to number of grades submitted as to their level. Students with either several AP grades or high AP grades tended to get rave references from their school.

Students who had submitted three or more AP grades got off to a running start in the freshman year. Two out of three maintained a B average compared with approximately one out of three non-AP students. How many used that running start to graduate early? Relatively few did. The multiple AP participants were much more likely to graduate early (6 percent) than were non-AP students or students submitting one AP grade (1 percent), but the actual number finishing in less than four years was quite small.

There was one other curious result associated with number of grades submitted. Students with two AP grades were substantially more likely to be admitted to a program of advanced study than were students who submitted either fewer or more AP grades (25 percent vs. 14 percent). Furthermore, their actual rate of admission to advanced study was half again as high as the rate predicted for this group. We looked to see if there was a pattern in the particular pair of examinations written by this group but found nothing to illuminate the puzzle (see technical note 7).

It does not necessarily follow that students who submit several grades will be placed forward in those courses. We

took one additional step in order to assess the four-year record of that group of students who were likely to have profited significantly from Advanced Placement in the freshman year. Examining each student's AP grade record in relation to AP credit policies of the individual institutions, we identified a group of students who achieved AP grades high enough so that they were likely to have been placed forward in at least two courses. There were 333 such students—7 percent of the entering freshmen, 30 percent of the AP freshmen. The profile for this group looked much like that of the students who submitted three or more AP grades (see Appendix A, Table A-11). Students with two or more credits can be described briefly as follows.

While this group had generally similar background characteristics compared to other freshmen, they were distinguished by high academic ability and a high incidence of academic and other honors in secondary school. These students attached special importance to liberal education and they were somewhat more inclined to take diverse coursework and to have double majors. They were slightly less likely to drop out of school than their classmates and slightly more likely to graduate early. While three out of ten seniors in these institutions graduated with academic honors, the incidence was five out of ten among students with two or more advanced placement credits. Furthermore, that number of honors graduates was significantly higher than would be expected on the basis of school rank and test scores alone. These students also surpassed others in their class with respect to leadership, significant accomplishments, and nomination by the college as most successful overall.

Senior Grades Revisited

We see that all AP students are not alike. Those with strong AP grade records show correspondingly strong academic performance in college. This gives us useful additional background to reexamine a question set aside earlier. In Figure 2 in Section 6 we saw that the yearly grade averages of non-AP and AP students climb year by year. The freshman GPA of AP students was significantly higher than that of non-AP students. That superiority was maintained in each successive year. But the difference diminished in the senior year and it was not clear why. Several hypotheses are suggested.

First, it is possible that the superior performance of the AP students is strongest in the lower division and fades somewhat in time. The fact that the senior GPA of the matched non-AP students shows a similar trend seems inconsistent with this hypothesis. Superior students in these colleges showed significantly less gain in GPA through the four years than was true of the typical student irrespective of AP status.

The second hypothesis stems from the finding in the study reported in Willingham (1985) that there were substantial differences in grading standards among curricula in the upper division. Perhaps the upper-division GPA of AP students does not increase as much as other students because more AP students are in more rigorous degree programs. Table A-5 in Appendix A indicates that that is partly true. On the other hand, we found the same pattern shown in Figure 2 when we analyzed separately the yearly grade records of three groups of students: those in natural science, those in the humanities, and those in the social sciences. These three broad areas were characterized by substantially different grading standards in these colleges, and would presumably show a different pattern of yearly grade averages if that was the reason for the effect shown in Figure 2.

The third hypothesis is that the more serious students are less likely to avoid rigorous courses in the senior year and therefore do not realize the benefits of the upward GPA creep that typifies the class as a whole. This hypothesis leads to the counterintuitive assumption that the strongest AP students would show the least GPA gain through the four years of college. That was in fact the case. Students who submitted AP grades of 1 or 2 gained .16 in their cumulative GPA from first to the fourth year, slightly more than the class as a whole. Students with AP grades above 4 showed the least GPA gain of any among a large number of AP subgroups examined (.04). If the low increase in the AP students' GPA through the four college years were due to some "fading of the AP effect," one would expect the strongest AP students to resist that fading rather than the other way around!

There is also the possibility that a ceiling effect diminishes the gain for better students. That is, a student already making A's can't go any higher. This likely affects only a few students. For the AP group as a whole, there was considerable room for improvement to the top of the grade scale. Altogether the facts seem to suggest that the AP students' grades tend to level off somewhat in the senior year because they tend to follow a more demanding course of study.

AP Grade as a Predictor

The data in Figure 5 illustrate that not all AP students overachieved academically. Students who submitted AP grades of 4 or 5 earned much higher college grade averages than predicted on the basis of school rank and SAT scores, but that pattern was not true for students who made AP grades of 1 or 2. In fact, the latter groups made slightly lower grades than predicted. The relationship shown in Figure 5 indicates that the AP grade provides useful information in forecasting the academic performance of these students. Predicting overall academic performance in college is not the purpose of AP Examinations nor does their validity depend on how well they correlate with GPA. Nonetheless an examination of the contribution of AP grades to other measures in predicting academic performance may be helpful in understanding these students and their performance in college.

We undertook several multiple regression analyses to see how well the AP grade average predicted grades in college and to what extent the AP grades added useful new information to the preadmission measures normally used in selecting students. The measures typically found to be the best predictors of academic success in college are, of course, school rank and admissions test scores (see Willingham and Breland 1982, chapter 9). In the Personal Qualities Project, four additional measures were found to be generally useful in predicting success in college, though they made only a marginal contribution in forecasting scholarship (see Willingham 1985, chapter 5). As indicated earlier, these four additional measures were high school honors, follow-through (significant extracurricular accomplishment), the applicant's personal statement, and the school reference. For this analysis, we had 1,040 students who had submitted an AP grade and had complete data on the other measures. The correlation matrix appears in Appendix A, Table A-12. The results of the multiple regression analysis are shown in Table 4.

Table 4. Multiple Correlations* Between Freshman Grade Average and Different Combinations of Predictors—with and without Average AP Grade as an Additional Predictor

	AP Grade Included as a predictor	
Predictors	*No*	*Yes*
School Rank	.402	.507
School Rank, SAT Scores	.470	.529
School Rank, SAT Scores, School Honors, Followthru, Personal Statement, School Reference	.487	.541

*See technical note 8.

The correlations reported in Table 4 are somewhat smaller than those typically found in validity studies because this analysis was based on an above-average group of students constituting only 23 percent of the incoming freshmen. Otherwise the three correlations in the first column show a typical pattern. School rank was a moderate predictor; SAT scores added useful information to school rank; and the other measures added relatively little to the first two predictors. The correlations in the second column show the substantial increase that resulted from adding AP grade average as an additional predictor.

Three comparisons are useful in illustrating the size of the increment. Adding the AP grade to school rank increased the multiple correlation more than did adding SAT scores to school rank (.507 vs. .470). Adding the AP grade to school rank and SAT scores increased the correlation more than did adding the four supplementary predictors identified earlier in the Personal Qualities Project (.529 vs. .487). Finally, the addition of the AP grade added .054 to the multiple correlation based upon the six best predictors previously identified (an increase of 11 percent in R, 23 percent in R^2).

It is quite unusual to identify a measure that adds this much useful new information. Why is the AP grade such a robust predictor? Probably because it weds the major advantages of a classroom grade and a standardized test. The classroom grade in secondary school is based on much the same type of performance as the college grade one is trying to predict. But school grades vary widely from teacher to teacher and the resulting GPA or class rank varies widely from school to school. The admissions test, being standard for all students, avoids those biases and fluctuations from classroom to classroom though it does not necessarily reflect accurately the quality of effort and learning represented by the student's immediately preceding academic work. Since the AP grade is based upon a standardized examination and is closely tuned to the immediately preceding academic work, the measure has some of the advantages of both school rank and the SAT.

Does this mean that we have an attractive new measure that can be added to the admissions officer's armamentarium? Not really. Recall that less than a quarter of the entering freshmen submitted an AP grade. For that reason Table 4 considerably overestimates the added value of the AP grade in predicting academic performance of the total class. This can be illustrated by examining the validity of an AP performance measure that is available for all freshmen—whether or not the student was a successful AP participant (that is, submitted a grade of 3 or higher). That measure contributes only about .01 to the multiple correlation (based either on school rank and SAT score, or on all six predictors previously identified). A serious problem with using successful AP performance as an additional piece of information in selecting students is that the Advanced Placement Program is not available to a substantial number of secondary school students. Finally, AP Examinations are taken principally by high school seniors and the grades are not available until late June, well after most selective colleges have chosen their class.

The main findings of this section may be summarized as follows. Students who submitted multiple AP grades were slightly more likely than their classmates to graduate early. Most evidently used their head start on graduation requirements to take more diverse coursework or a double major. These multiple AP participants tended to be superior students who achieved college academic honors somewhat more frequently than would be expected on the basis of their school rank and test scores.

The AP grades earned by students participating in the Advanced Placement Program were good indicators of achievement in college. Students who earned an AP grade of 1 or 2 looked like and performed like non-AP students. Students who earned an AP grade at the level most typically recommended for advanced standing (3 or higher) earned

higher—often much higher—college grades than predicted on the basis of school rank and test scores. This result adds confirming evidence regarding the reasonableness of AP grading standards and the program's credit recommendations, which characterize 3 as "qualified" in the subject.

The substantial difference in predicted and actual performance of students who had earned high or low AP grades had another important implication. The AP grade average added substantially to efficiency of academic prediction for those students who had submitted AP grades. This finding was not, however, viewed as necessarily useful information to admissions officers because of the limited availability of AP grades and the equity issues that such use would raise.

9. DIFFERENCES ACROSS SUBJECT AREAS

In a sense the Advanced Placement Program is not one program but a series of coordinated programs in 13 subject areas. In each of these subjects there are one or more courses, each with a syllabus, an examination, a series of publications, an overseeing committee of teachers from schools and colleges, a similarly constituted grading team, and so on. While these parallel AP programs in the different subject areas are guided by the same philosophy and operating procedures, there are elements of independence among them. Also, it is clear that the subjects themselves are very different.

Given that set of circumstances, it is reasonable to ask whether the main facts regarding the ability and performance of AP students as a group are true of those students who take examinations in the various subject areas. In this section we address that question. We also reexamine more carefully two aspects of college experience where the particular AP subject studied in secondary school should have a special bearing: college coursework and the degree program selected.

First, a few brief comments on the way we approached the task and the pattern of subject grades that these AP students tended to select. In order to work with large enough groups so that the results would be reasonably dependable, the 21 different AP Examinations offered in 1979 were categorized into six areas: English, history, language, biology, mathematics, and physical science. This analysis omits some 5 percent of the AP grades—those grades submitted in art or music.

English was the most common AP Examination taken by the group of students in this study. Almost twice as many took English as took history or mathematics. The latter two subjects were, again, about twice as common as were language, biology, or physical science (see Appendix A, Table A-13 for details). When a student took more than one examination, the most common pair was English and history. English and mathematics were another common pair but it is difficult to evaluate the pattern of choices simply by counting the number of exams submitted because different patterns of examinations are available in different schools. For example, where only two examinations are available in a school, English and mathematics are a fairly common pair. In order to get around the problem of uneven availability of AP courses, we looked at the pattern of AP Examinations written by the group of 1,776 incoming freshmen who had attended secondary schools that offered at least five AP courses.

Two facts were revealed by this analysis. First, it was true in all possible pairs of the subject areas (for instance, language and mathematics) that the decisions to take AP Examinations were positively related. That is, the fact that a student took an AP Examination in one of the pair increased the probability that he or she also took an AP Examination in the other subject. The degree of that association varied, of course, depending upon the particular pair of subjects, and that leads to the second fact. The six subjects tended to group into two clusters as reflected by students' decisions to take or not take the various subjects. It is no surprise that one cluster consisted of the humanities (English, history, and language) while the second consisted of biological science, mathematics and physical science (see technical note 9). These two clusters were often reflected in the results that follow.

Profiles by Subject Areas

In comparing students who took AP Examinations in the six subject areas (see Appendix A, Table A-14), the first substantial difference that comes to light is the representation of men and women. In English and foreign languages some three out of five AP students were women. At the other extreme, only one out of four students taking an AP Examination in physics or chemistry was a woman. In most of the subject areas approximately the same proportion of students came from private as compared to large public secondary schools. There was substantially heavier private than public school representation, however, among the AP students who took foreign languages (37 percent vs. 23 percent) and biological science (37 percent vs. 16 percent). It is not clear to what extent this represents a different interest of private versus public school students or a difference in the availability of AP courses in those areas.

As would be expected, students taking AP Examinations in the humanities (English, history, and foreign language) more often rated liberal education as a very important educational goal. Among these six subject areas, students taking an AP Examination in physical science were least likely to rate liberal education an important educational goal. It is important to note on the other hand that even in this area students rated liberal education as highly as did non-AP students on the average.

How do students taking different AP Examinations compare as to academic ability and performance in secondary school? There were not large differences. In each subject area the AP students were substantially more able than non-AP students. For example, in the non-AP group about one student in four scored 600 or higher on the SAT, while in

each of the subject areas at least 50 percent of the AP students scored that high. AP students in physical science and mathematics were more frequently at that level; among these scientifically inclined students, 3 out of 4 scored above 600.

Class rank and academic honors in secondary school showed basically the same pattern for students who took different examinations. For example, in each subject area, AP students were at least twice as likely to win academic honors as were non-AP students. Again, students in physical science and mathematics were particularly high, though academic honors in secondary school also went fairly frequently to AP students in the foreign languages. AP foreign language students also got very high ratings on the personal statement prepared by applicants for admission. That may be because students studying foreign languages often have a different set of experiences and accomplishments to talk about. In the ratings of these personal statements, raters were instructed to pay special attention to evidence of additional accomplishments not represented elsewhere in the student's application. School references were uniformly high for AP students in each subject area. This suggests that teachers in the different academic disciplines do not vary a great deal regarding their disposition to write very strong recommendations.

In college there were no significant differences among the students who took the various AP subject examinations with respect to persistence to the senior year. And yet, there were differences across subject areas with respect to early graduation. Students who took AP Examinations in English and foreign languages seemed no more likely to graduate early than non-AP students (about 1-2 percent). Students taking other subject exams did show a small tendency to graduate early (about 4 percent) but the much bigger difference was in physical science. There, one student out of ten graduated ahead of his or her class. While that is not a large percentage in absolute terms, it is an atypical pattern for the institutions in the study.

Each of the various groups of students taking the different subject examinations did quite well the freshman year. There were some differences. The students who took the AP Calculus Examinations were the group most likely to make a B average in the first year. But the more obvious finding is that students in all AP subject areas did substantially better than their non-AP classmates. The same general pattern held with respect to academic honors at graduation. AP students in each subject area far exceeded the record for the class as a whole in this regard. There was some tendency for students who took one of the AP Examinations in calculus or English to win academic honors in college at a somewhat higher rate than would be predicted on the basis of their achievement in secondary school.

With regard to overall success in college, all groups were average or better. Among non-AP students, 19 percent were nominated "most successful" by their college. The corresponding rate for groups of students who took the various AP Examinations ranged from 20 percent (biology) to 28 percent (English).

The proportion of students admitted for advanced study as of June of the senior year was higher among each of the AP subject groups than for non-AP students. The percentages across subject areas did not vary a great deal and tended to follow fairly closely the predicted level. Physical science may be an exception. One gets a clearer picture by looking at the group of students who came from secondary schools with broad AP offerings. Within that group, students who took AP Examinations in the physical sciences were significantly more likely than other AP students to be admitted to selective programs of advanced study following college. The advanced study rate for these students (27 percent) was almost three times as high as that of non-AP students.

The Academic Program

In any effort to describe the overall college experience of Advanced Placement students, it is particularly useful to give an account of the course of study selected by these students. There are two particular points of interest: their choice of courses and their choice of major. It is essential, of course, to analyze the data subject by subject.

With respect to choice of coursework, a frequent question in the minds of some faculty is whether students granted advanced standing in a subject are therefore less likely to avail themselves of courses offered by the department. If that were the case, granting advanced standing might pose some conflict between serving the educational interests of the students and maintaining course enrollments. A related question is whether students who take a particular AP subject in secondary school are more likely to major in that subject in college. Electing to take an AP course is probably more often than not an expression of interest in the subject, tentative and ill-informed though the interest may be. If the AP experience is positive and tends to reinforce that early interest, one would expect that students who had taken an AP subject in secondary school would be more likely to major in that area in college than would the average student.

We had from the Personal Qualities study some useful, though limited, data regarding course selection. Seniors were asked how many courses they had taken in each of the following nine areas.

1. Literature/history
2. Foreign languages
3. Biological science
4. Computer science/mathematics/statistics
5. Physical science
6. Economics/political science
7. Music/art/drama
8. Philosophy/religion
9. Psychology/sociology/anthropology

Because the questionnaire was designed for other pur-

poses and far in advance of any plan to follow up the AP students, there is not a perfect correspondence between these course groupings and the AP subject areas. Literature/history, for example, encompasses two of the AP subject areas of interest here. Numbers 2 through 5 in the list above do correspond fairly closely to the remaining four AP subject areas in this study.

Overall, the proportion of AP seniors who took at least one year of coursework in each of these several areas was about the same as the percentage for seniors generally. As would be expected students who took an AP course in English, history, or foreign languages were more likely to take college work in the humanities. Similarly, students who took an AP course in mathematics, biology, or physical science were more likely to take college work in the natural sciences. For example, the percentage of students taking foreign language in college was about twice as high for those who submitted an AP English grade (48 percent) as for those who submitted an AP grade in physical science (25 percent). Appendix A, Table A-15 provides detailed data.

The more important questions concern the college course of study in those particular areas corresponding to the AP grade submitted by the student. Those findings are summarized in Figure 6. The results show consistently that students who submitted an AP grade in a subject area were more likely to take at least one year of coursework in that area than were their classmates generally. In the natural sciences the difference is quite substantial. In the humanities the differences were less clear partly because English and history coursework were not distinguishable, and possibly also because very large numbers of students are routinely required to take courses in those areas in order to fulfill distribution requirements.

The bottom half of Figure 6 shows more dramatic differences with respect to choice of major. Students who had submitted an AP grade in one of the six subjects were substantially more likely to major in the same area. In fact, the percentage of students pursuing a degree in one of the six subjects was at least twice as high for those who had submitted an AP grade in the subject as for seniors generally. In physical science the rate was five times as high.

One implication of these data is that the submission of an AP grade in a subject is strong evidence of interest in that subject—interest that is very likely to be reflected in continued academic work in the same field. We had on our research tapes no detailed records of what specific courses students had taken. The fact that most of these AP grades were at a credit level (3 or higher) suggests that most of the AP students were placed ahead and that the larger number of courses these students take in the subject corresponding to the AP Examinations would tend to be concentrated in higher-level courses. That plus the fact that students frequently major in AP subjects they had taken in secondary school indicate that the AP record of incoming freshmen provides useful leads for a department as to who their upper-division students are likely to be.

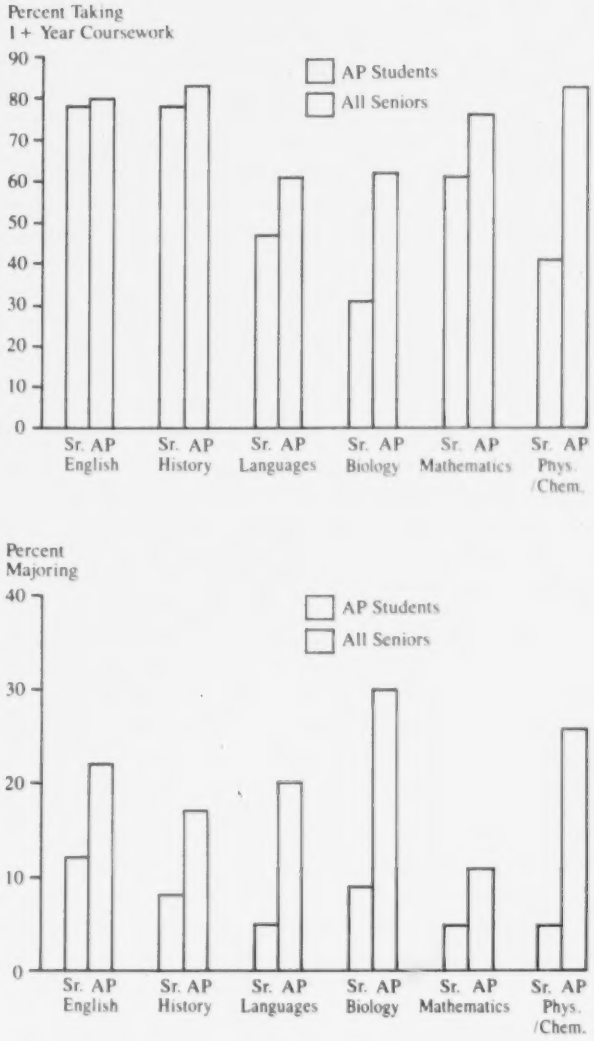

Figure 6. Percentage of Students Taking a 1+ Year of Coursework or Majoring in Each of Six Academic Subjects—All-Seniors Rate Compared with Rate for Seniors Who Submitted an AP Grade in the Subject

We looked at two other pieces of information concerning the course of study of these students: the number taking diverse coursework (a year or more in at least six of the nine academic areas listed earlier) and the number completing requirements for a degree in more than one area. On these two measures there was a clear difference between students who had submitted AP grades in the humanities as opposed to the natural sciences. Students who had submitted AP science grades undertook double majors in college with about the same frequency as seniors generally (17 percent). But students who had submitted AP grades in humanities were about a third more likely to pursue two majors in college.

Interestingly enough, this situation was reversed with respect to diverse coursework. Students who had submitted

an AP grade in the humanities followed a diverse curriculum about as often as seniors generally, while students who had taken AP work in the natural sciences were somewhat more likely to spread their coursework across the curriculum. This result sounds counterintuitive because diverse coursework and majoring in two areas would seem to go together; that is, both reflect broad academic interests. As it actually works out, however, pursuing a degree in two areas probably reduces a student's flexibility for taking coursework in a number of different areas because of the additional course requirements that are concentrated in the two degree areas.

These results may be summarized as follows. Looking at the background and college performance of groups of students who took different AP Examinations yields one main impression: there is much less difference among groups of AP students from subject to subject than there is between AP and non-AP students generally. In searching for small deviations that might distinguish to some extent AP students in the various subject areas, one does detect some differences favoring students who took AP English, mathematics or physical science. These groups tended to achieve at a high level even in comparison to other AP students. The physical science group showed some evidence of taking special advantage of the AP Program to move quickly on to postbaccalaureate study. Students who had taken AP biology tended to be not quite as strong a group as other AP students, but again, they clearly outperformed non-AP students in most respects.

With respect to course of study, the results were quite clear. AP students who studied a particular subject in secondary school did not take less college coursework in that area. In fact in each subject examined, they took more coursework in the same area than did their classmates generally. That submitting an AP grade in a subject indicates special interest in that academic area was strongly supported by the pattern of majors chosen. In each of the subject areas examined, students who submitted an AP grade in that subject were 2 to 5 times as likely to major in that area as were college students generally. We have here no controlled experiment. It is not possible to conclude from these data that the AP experience solidified interest in an academic area and influenced a subsequent choice of major, though that undoubtedly happened in a number of cases. It is clear, however, that among incoming freshmen, students who are likely to take coursework and major in a particular department are heavily overrepresented among the students who have taken AP work in the area in secondary school.

10. SUMMARY OF FINDINGS

The object of this study was to examine in some detail the college careers of students who had participated in the Advanced Placement Program in secondary school. Our purpose was not to validate individual examinations or credit policies but to contribute to a broader understanding of Advanced Placement as an educational strategy. More specifically, if AP students are placed ahead in college on the basis of work in secondary school, how do they fare in college over four years?

The study was made possible by the availability of a very extensive file of information on 4,814 students who participated in the Personal Qualities Project—a longitudinal study in nine participating colleges and universities. The file included 1,115 AP and 3,669 non-AP students. We contrasted these groups on a number of measures: background characteristics, special achievements in secondary school, goals and interests, experience in college, and different measures of success. Various subgroups of AP students were also compared. The main findings can be summarized with the following series of questions.

How do AP and non-AP students compare at time of entry to college?

The AP students tended to come from somewhat more-advantaged homes and from secondary schools that placed special emphasis on college preparation. As applicants they were more likely to come to the college campus for an interview, and they were more likely to express intellectual leanings with respect to their educational and career goals. The most substantial differences, however, were in academic ability and related achievements. The AP group were twice as likely to have scored over 600 on the SAT and twice as likely to have won academic honors in secondary school. With the exception of athletic accomplishments, AP students were significantly higher than the non-AP students on all 19 preadmission measures of ability and achievement.

Do AP and non-AP students take a similar academic program on a similar schedule?

These AP students were more likely than their classmates to specialize in majors that had tougher grading standards, and were more likely to graduate with a double major. The AP students had a significantly lower dropout rate (15 percent vs. 26 percent) but very few (3 percent) graduated ahead of schedule. By June of the senior year almost twice as many (17 percent vs. 9 percent) of the AP students had been admitted to a doctoral-level program as compared to their non-AP classmates.

How do AP students perform academically through four years?

A substantially larger proportion of the AP freshmen made a B average than did their non-AP classmates (59 percent vs. 37 percent). In large part they maintained that advantage in each of their college years. Among the AP group 41 percent graduated with honors compared with 26 percent of the non-AP group. AP students were more frequently awarded college as well as departmental honors but especially the latter, based upon a senior thesis or some similar exemplary project.

Do AP students do as well as would be expected in their college academic work given their superior ability and record of achievement in secondary school?

In order to answer this question our AP students were compared with a matched group of non-AP classmates in the same college who had essentially identical average scores on six preadmission measures including SAT scores and school rank. The college academic record of the AP students was superior to that of the matched non-AP group. Compared to classmates of the same ability, the AP students were more likely to maintain a B average in the freshman year (59 percent vs. 44 percent) and more likely to graduate with academic honors (40 percent vs. 33 percent). The AP students exceeded the matched non-AP group in both college honors and departmental honors. In the matched groups the AP students also had a statistically significant advantage with respect to rate of admission to advanced study (medicine, law, or Ph.D. programs).

How do AP students fare on broader criteria of success in college?

In this study we were able to compare AP and non-AP students on several broad criteria in addition to scholarship. These included leadership (college-appointed positions and student-elected offices), significant accomplishments, (scientific, creative, organizing, and so on) and a special category of students nominated by the college as "most successful" overall. On each of these broad criteria the success rate of AP students was significantly higher than that of non-AP students. Comparing the matched groups, AP students were more frequently cited as leaders and as most successful overall. It appears, however, that the AP students were more frequently appointed to leadership positions by the college and more frequently selected as most successful seniors largely because of their unusually strong academic record.

Are the differences between AP and non-AP students generally comparable for major groups of students?

In large part, the answer appears to be yes. There was a generally similar contrast between AP and non-AP students regardless of whether one compares men or women, students from public or private secondary schools, freshmen at more- or less-selective colleges, or students who have submitted one or another AP Examination. All of these subgroups of AP students tended to be more able than non-AP students and to perform at a higher level in college. There were some variations from group to group but overall the data for subgroups of AP students were characterized more by consistency than idiosyncracy.

Does Advanced Placement in particular subjects reduce the likelihood of students taking college coursework in those areas?

These data indicate that it is more the contrary. In each subject examined, students who wrote an AP Examination took more college coursework in that area than did their classmates. They were also two to five times as likely to major in that subject as were college students generally. Evidently submitting an AP grade in a subject is an indication of special interest in that academic area. These findings suggest that college departments might expect to find their upper-division students heavily represented among entering freshmen who have submitted AP grades in the same subject area.

What are the implications of multiple AP grades?

Students who submitted several AP grades tended to be better students in school and college as compared to those who submitted only one grade. The large difference, however, was between AP and non-AP students, not between students who submitted one, two, or three AP grades. The main difference associated with number of AP grades submitted was, as one might expect, the likelihood of graduating early. Even here the difference was not consequential—1 percent vs. 6 percent early graduates among those groups of students who submitted one versus three or more AP grades respectively. Taking into account the level of the grades submitted did not change the picture in any significant way, because the multiple AP grade submitters were much the same people as those who met the AP credit standard in several subjects. Among the students who submitted three or more AP grades, 84 percent had at least two AP grades that met the credit policies of the institution in the relevant subject area.

What are the implications of high versus low AP grades?

The level of AP grades submitted was much more indicative of college performances than was the number of grades submitted. All of the things that tended to be true about AP students generally, were more so when it came to those who submitted high AP grades. About one AP student out of seven submitted AP grades that averaged above four. About three out of four in this group had SAT scores above 600 and ranked in the top decile of their high school class. On that basis we would expect about 48 percent to graduate with college honors; actually 61 percent did so. Less than half that many graduated with honors among the students who submitted AP grades lower than three. Overall, the data indicated that students who earned AP grades of three or higher do quite well in college in relation to what one would expect from their previous record. This finding was fairly consistent in the more- as well as the less-selective colleges and tends to corroborate the program's characterization of the 3 grade as "qualified" for advanced standing.

Is the AP grade a useful predictor of college performance?

The AP grade was a good predictor of college GPA. For those students who submitted AP grades, the AP average added substantially to measures traditionally used in selective admissions. One cannot conclude, however, that the AP grade can usefully serve in that connection. This is partly

because AP grades are available for only a limited proportion of candidates for admission. Their value in improving grade predictions for the overall class is thereby considerably diminished. Even for the limited proportion, AP grades came too late in the year to affect admissions decisions. Furthermore, use of the AP grade in selective admissions would raise an issue of fairness because AP courses are not available to many high school students.

Is the superior performance of AP students associated with AP participation or with the phenomenon that AP students typically attend strong secondary schools?

Our data seem to indicate that part of the superiority of AP students is associated with their tendency to come from secondary schools that place emphasis upon preparation for college. It is also true, however, that within the same type of secondary school, students who participated in the AP Program tended to do better in college than students who did not. Both factors appeared to play a role. It is not possible to ascertain from this analysis to what extent the "AP effect" is *caused* by strong preparation in secondary school, or by other factors. One good possibiity is the self-selection of well-motivated students. These two forces are probably both at work and they likely interact.

We conclude finally that these results clearly support the basic rationale of Advanced Placement as an educational strategy. The main assumptions are that placing a student ahead on evidence of adequate preparation is a reasonable proposition, that educational progress will not thereby be disrupted, and that on average students will achieve as expected. In fact, there is considerable evidence here that, as a group, the AP students do even better than expected in college, particularly those students who make AP grades of 3 or better. Their success is broadly based but largely traceable to traditional academic achievement—good grades and other evidence of scholarly talent.

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APPENDIX A: TABLES

Table A-1. Background Characteristics of AP and Non-AP Freshmen

Background Characteristic	*All Freshmen*		*% with Characteristic Indicated*			
			All AP	*All Non-AP*	*Matched Samples*	
	N	*% AP*	*Freshmen*	*Freshmen*	*AP*	*Non-AP*
Women	2243	25	50*	46	51*	44
Minority	196	15	3*	5	3	3
Disadvantaged	421	20	8	10	7	9
Distant Resident	1351	22	27	29	26	25
Local Resident	562	21	11	12	10	10
Secondary School						
Private	1127	27	28*	22	28*	20
Large Public	912	28	26*	19	25*	20
Small Public	222	5	1*	6	1*	6
Public; >67% to Col.	524	24	16	15	15	15
Public; 34-66% to Col.	1422	23	40	41	40	44
Public;≤33% to Col.	580	19	14*	17	14*	19
Parent						
Prominent Occupation	424	30	12*	8	12*	9
Highly Educated	1156	28	29*	23	30	27
Admissions Process						
Came for Interview	2163	27	53*	43	54*	45
Early Applicant	930	28	24*	18	23	20
TOTAL N	4814	23%	1115	3699	939	939

*AP and non-AP groups differed significantly; chi square, $p<.05$.

Table A-2. Educational and Career Goals of AP and Non-AP Freshmen

Goal	All Freshmen		% with Goal Indicated			
			All AP	All Non-AP	Matched Samples	
	N	% AP	Freshmen	Freshmen	AP	Non-AP
"Very Important"						
Educational Goal:						
Intellectual						
Liberal Education	1617	29	46*	36	46*	39
Intellectual Skills	2226	25	55	53	55	57
Moral Values	358	32	11*	8	12	10
Social Awareness	427	22	9	11	9	10
Creative Talents	911	27	24*	21	24*	20
Personal						
Physical Development	913	21	19*	23	20	20
Leadership Training	1309	28	36*	30	35*	29
Personal Relations	690	26	18	16	18	16
Social Competence	1690	23	39	41	39	41
Career						
Professional Training	1980	22	42*	49	43	46
Practical Skills	885	25	22	21	22	20
Career Exploration	1237	27	33*	29	32	28
Tentative Career Goal:						
Business	527	16	8*	12	8*	10
Public Admin.	126	27	3	3	3	3
Professional	1370	27	33*	27	34*	30
Scholar/Scientist	391	36	13*	7	13*	9
Technology	343	24	7	7	7	9
Human Services	425	14	5*	10	5*	8
Artistic	148	20	3	3	2	4
Undecided	1484	21	28*	32	28	27

Note: See technical note 1 concerning sample sizes.
*AP and non-AP groups differed significantly; $p<.05$.

Table A-3. Preadmission Qualifications of AP and Non-AP Freshmen

	All Freshmen		% with High Qualification Indicated			
			All AP	All Non-AP	Matched Samples	
*High Qualification**	*N*	*% AP*	*Freshmen*	*Freshmen*	*AP*	*Non-AP*
School Rank, Top decile	1909	33	57†	35	54	57
SAT, 600 +	1590	40	57†	26	54	54
Academic Honors (4 +)	567	41	21†	9	18	20
Extracurricular Achievement						
Community Activities (4 +)	303	30	8†	6	8	7
Athletic (4 +)	1488	21	29†	32	29	32
Leadership (4 +)	821	30	23†	16	22	20
Creative (4 +)	613	28	16†	12	15	14
Follow-through (5)	833	28	21†	17	21	20
Personal Statement						
Writing (5)	225	29	6†	5	6	7
Content (5)	378	31	11†	7	11	12
Average (>4)	446	31	13†	9	13	14
School Reference						
Teacher Reference (5)	299	38	15†	11	13	16
School Report (5)	459	30	13†	10	11	13
Average (>4)	534	33	16†	10	14	15
Admissions Ratings						
Outstanding Interview	477	35	28†	20	26	29
Unusual Maturity	300	40	11†	5	10	8
Intellectual Orientation	167	52	8†	2	7	5
Overall Academic (5)	432	41	16†	7	14	13
Overall Personal (5)	399	27	10†	8	10	11
TOTAL N	4814	23%	1115	3699	939	939

*Applicant ratings on a 5-point scale are indicated in parentheses.
†AP and non-AP groups differed significantly; $p < .05$.

Table A-4. Means of Preadmissions Matching Variables for AP and Non-AP Students—All Freshmen, Matched Samples, and Persisting Seniors

Preadmission Matching Variable	All Freshmen				Matched Freshmen*		Persisting to 4th Year	
	X AP	*X Non-AP*	*S.D.*	*X. Diff S.D.*	*X AP*	*X Non-AP*	*X AP*	*X Non-AP*
School Rank	54.9	50.0	10.18	.48	54.4	54.7	54.7	55.5
SAT	606	541	83	.78	599	598	603	602
Academic Honors	2.73	2.18	1.05	.52	2.65	2.69	2.68	2.75
Follow-through	3.60	3.38	1.02	.22	3.58	3.54	3.63	3.60
Personal Statement	3.53	3.37	.66	.24	3.52	3.52	3.55	3.54
School Reference	3.68	3.51	.65	.26	3.64	3.65	3.66	3.68
TOTAL N	1115	3699			939	939	792	763

*See note 2 for a description of the matching procedure.

Table A-5. Course of Study for AP and Non-AP Students

Seniors Who:	Seniors N	Seniors % AP	% with Experience Indicated: All AP Seniors	All Non-AP Seniors	Matched Samples AP	Matched Samples Non-AP
Completed a degree in*:						
Arts	255	24	6	7	7	6
Humanities	949	32	32†	24	32†	27
Physical Science	610	33	21†	15	21	19
Biological Science	345	33	12†	8	13	11
Social Science	1379	23	33†	39	33†	38
Business	341	12	4†	11	5†	7
Two Majors	586	30	19†	15	19	15
Did One Year+ Coursework in:						
Biological Science	745	31	35†	29	35	30
Computer Science, Math	1459	27	59	61	59†	65
Economics, Political Science	1509	26	59†	64	59†	65
Foreign Languages	1164	26	46	50	45	41
Literature, History	1886	27	77	79	77†	83
Music, Art	923	32	45†	36	45	47
Philosophy, Religion	807	29	35	33	36	36
Physical Science	971	30	45†	39	45	43
Psychology, Sociology	1320	24	48†	58	48	52
Held an:						
Internship	577	28	24	23	25	23
Assistantship	408	35	21†	15	21	20
Took diverse courses	579	27	24	24	24	27
Intended graduate study	846	33	42†	32	40	39
Had a career plan	1284	28	53	52	54†	47
Sr. Questionnaire Respondents	2443	27%	665	1778	552	497

*Data on degrees are based upon all seniors; N's for AP and non-AP seniors are shown in Table A-7. Other data here are based upon senior questionnaire respondents; those N's are shown in the bottom line.
†AP and non-AP groups differed significantly; $p < .05$.

Table A-6. Self-Ratings of Progress Toward Educational Goals by AP and Non-AP Students at End of Freshman Year

Students Reporting Satisfactory Progress on:	All Freshmen N	All Freshmen % AP	% Reporting Satisfactory Progress: All AP Freshmen	All Non-AP Freshmen	Matched Samples AP	Matched Samples Non-AP
Intellectual Goals						
Liberal Education	2247	26	69	65	69	67
Intellectual Skills	1993	25	58	59	58	59
Moral Values	1321	28	43*	37	44*	39
Social Awareness	785	28	26*	22	25*	19
Creative Talents	1091	25	31	32	31	31
Personal Goals						
Physical Development	1833	25	52	54	52	54
Leadership Training	1702	26	50	50	50	45
Personal Relations	1475	25	43	44	44	42
Social Competence	2347	26	71	68	72*	66
Career Goals						
Professional Training	1584	28	51*	45	52*	45
Practical skills	1533	25	45	45	46	42
Career Exploration	1508	25	44	44	45	42
Freshman Questionnaire Respondents	3405	25%	862	2543	719	687

*AP and non-AP groups differed significantly; $p < .05$.

Table A-7. College Success of AP and Non-AP Students Through Four Years

Type of Success	*All Students*		*% in Success Group Indicated*			
	N	*% AP*	*All AP Students*	*All Non-AP Students*	*Matched Samples AP*	*Matched Samples Non-AP*
Attainment						
% of Freshmen						
Persisting to the 4th year	3676	26%	85%	74%	84%	81%
% of Seniors						
Graduated early (before 6/83)	59	42	3*	1	3*	1
Accepted in Law/Med./Ph.D. Program (by 6/83)	412	38	17*	9	17*	13
Marks of Success (Seniors)						
Significant Accomplishment	886	34	32*	22	32	29
Scientific	127	40	5*	3	5	4
Artistic	158	38	6*	4	6*	4
Communication	124	40	5*	3	5	4
Physical	188	23	5	5	5	5
Organizing	225	33	8*	6	9	8
Other Independent	373	38	15*	9	15	13
Leadership	1280	30	40*	33	40*	34
Elected Office	669	27	19	18	19	18
Appointed Position	841	32	29*	21	28*	23
Scholarship	1090	36	41*	26	40*	33
College Honors	944	36	36*	22	35*	30
Departmental Honors†	378	39	19*	13	19*	14
Nominated Most Successful						
By College	741	32	25*	18	25*	21
By Peers	653	30	21*	17	20	20
TOTAL SENIORS	3676	26%	952	2724	792	763

*AP and non-AP groups differed significantly; $p < .05$.

†Based upon students in six colleges with organized departmental honors programs. See technical note 5.

Table A-8. Selected Profile of AP Students by Sex and College Selectivity

Profile Characteristic	*All AP*	*% with Characteristic Indicated*			
				College Selectivity	
		Men	*Women*	*Less*	*More*
FRESHMEN (N)	1115	559	555	482	632
Background					
Women	50	0	100	53	48
Private School	28	31*	25*	27	28
Large Public School	26	23*	29*	30*	23*
Highly Educated Parent	29	31	28	25*	33*
Liberal Educ. Important	46	41*	51*	43*	49*
School Achievement					
Rank, Top decile	57	49*	64*	47*	64*
SAT, 600+	57	62*	53*	37*	73*
Academic Honors (5)	21	21	21	16*	25*
Follow-through (5)	21	22	21	16*	26*
Personal Statement (>4)	13	13	13	10*	15*
School Reference (>4)	16	15	18	9*	22*
Persist to Senior Year	85	86	85	77*	92*
SENIORS (N)	952	478	473	370	582
College Major					
Natural Science	32	39*	25*	26*	36*
Humanities	32	28*	37*	30	34
Social Science	33	34	32	35	32
Double Major	19	18	19	16	20
College Performance					
B Average, 1st Year	59	55*	63*	58	59
Early Graduate	3	4	2	2	3
Honor Graduate					
Predicted	37†	36	38†	39†	36†
Actual	41	38*	45*	44	40
Most Successful					
Predicted	23	22	24†	28	20
Actual	25	22*	29*	31*	22*
Advanced Study					
Predicted	15	16†	14	14	16
Actual	17	20*	14*	16	18

*The two subgroups are different on this characteristic. P≤.05.

†Actual performance differs from predicted, p≤.05. See technical Note 4.

Table A-9. Selected Profile of AP Students by Type of Secondary School

Profile Characteristic	*All AP Students*	*% with Characteristic Indicated*			
		Public School	*Private School*	*Light AP School*	*Heavy AP School*
FRESHMEN (N)	1115	764	308	476	590
Background					
Women	50	53*	45*	53	47
Private School	28	0	100	20*	33*
Large Public School	26	36	0	20*	33*
Highly Educated Parent	29	27*	38*	26*	32*
Liberal Educ. Important	46	46	47	43	49
School Achievement					
Rank, Top decile	57	67*	29*	65*	50*
SAT, 600 +	57	61*	49*	54*	61*
Academic Honors (5)	21	22	18	22	20
Follow-through (5)	21	21	22	23	20
Personal Statement (>4)	13	10*	18*	11	14
School Reference (>4)	16	16	19	14	18
Persist to Senior Year	85	86	83	84	87
SENIORS (N)	952	659	257	400	515
College Major					
Natural Science	32	37*	20*	32	32
Humanities	32	29*	41*	32	32
Social Science	33	31	37	31	35
Double Major	19	19	18	20	17
College Performance					
B Average, 1st Year	59	62*	52*	59	59
Early Graduate	3	2	3	2	3
Honor Graduate					
Predicted	37†	40	30†	40	35†
Actual	41	41	41	42	39
Most Successful					
Predicted	23	25	18	25	22
Actual	25	27*	19*	28	24
Advanced Study					
Predicted	15	17	12	16	14
Actual	17	19*	13*	17	17

*The two subgroups are different on this characteristic; P≤.05.

†Actual performance differs from predicted, p≤.05. See technical Note 4.

Table A-10. Selected Profile of AP Students by Level of AP Grade

Profile Characteristic	*% with Characteristic Indicated*			
	All AP Students	*Average AP Grade*		
		<3.0	3.0–4.0	>4.0
FRESHMEN (N)	1115	264	685	165
Background				
Women	50	47	50	53
Private School	28	31	27	23
Large Public School	26	23	27	28
Highly Educated Parent	29	24*	29*	36*
Liberal Educ. Important	46	41*	46*	56*
School Achievement				
Rank, Top decile	57	45*	58*	73*
SAT, 600 +	57	34*	60*	83*
Academic Honors (5)	21	8*	22*	38*
Follow-through (5)	21	22	21	22
Personal Statement (>4)	13	10	12	18
School Reference (>4)	16	12*	16*	24*
Persist to Senior Year	85	80	87	88
SENIORS (N)	952	211	596	145
College Major				
Natural Science	32	32	32	35
Humanities	32	20*	34*	42*
Social Science	33	39*	33*	26*
Double Major	19	15	19	22
College Performance				
B Average, 1st Year	59	38*	61*	79*
Early Graduate	3	2	3	3
Honor Graduate				
Predicted	31†	29	37†	48†
Actual	41	29*	41*	61*
Most Successful				
Predicted	23	21	23†	26
Actual	25	19*	27*	29*
Advanced Study				
Predicted	15	13	15	19
Actual	17	17	16	21

*The 3 subgroups of AP seniors are significantly different on this measure.
†Actual performance differs from predicted, $p \leq .05$

Table A-11. Selected Profile of Students by Degree of AP Participation

Profile Characteristic	% with Characteristic Indicated					
	No. of Grades Submitted				2+ AP Credits	Jr. Year Exam
	0	1	2	3+		
FRESHMEN (N)	3699	605	288	221	333	260
Background						
Women	46	55*	44*	43*	47	38*
Private School	22	26	28	33	27	34*
Large Public School	19	26	26	26	28	26
Highly Educated Parent	23	29	31	28	29	31
Liberal Educ. Important	36	42*	48*	54*	52*	52
School Achievement						
Rank, Top decile	35	53*	56*	68*	69*	60
SAT, 600+	26	49*	61*	76*	76*	69*
Academic Honors (5)	9	18*	20*	31*	30*	24
Follow-through (5)	17	21	19	25	24	27*
Personal Statement (>4)	9	11*	13*	18*	17*	15
School Reference (>4)	10	13*	16*	25*	22*	22*
Persist to Senior Year	74	85	84	90	88	87
SENIORS (N)	2724	512	242	198	294	226
College Major						
Natural Science	23	28*	38*	36*	36	31
Humanities	24	31	31	35	37*	35
Social Science	40	34	31	33	30	35
Double Major	15	16	21	21	22*	18
College Performance						
B Average, 1st Year	37	56*	58*	67*	68*	64*
Early Graduate	1	1*	3*	6*	5*	4
Honor Graduate						
Predicted	27†	34†	39	44	44†	42†
Actual	26	38*	43*	49*	50*	49*
Most Successful						
Predicted	20	22	24	24	25	25
Actual	18	25	27	24	28	26
Advanced Study						
Predicted	11	14	16†	18	17	18
Actual	9	14*	25*	14*	20	18

*Students submitting 1, 2, or 3 exams differed significantly; students submitting a junior year AP Examination or 2 or more grades high enough to earn credit differed significantly from other AP seniors on this characteristic. See technical note 3 for explanation of credit determination.

†Actual performance differs from predicted, $p \leq .05$.

Table A-12. Intercorrelations Among Preadmissions Qualifications, AP Performance, and College Grades (Decimals Omitted; N = 1040)

	Variable									
Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. SAT										
2. School Rank	26									
3. School Honors	39	39								
4. Follow-through	−01	09	09							
5. Personal Statement	03	−03	02	11						
6. School Reference	−01	16	08	13	09					
7. Mean AP Grade	35	15	21	−04	08	05				
8. No. of AP Grades	22	09	09	03	05	06	04			
9. Freshman Average	34	40	29	08	10	07	37	11		
10. Cumulative Average*	29	38	26	08	14	09	31	08	85	
Mean	607	54.9	2.75	3.61	3.54	3.67	3.30	1.76	2.98	3.07
Standard Deviation	71	9.2	1.06	.99	.64	.64	.96	1.03	.55	.50

Note: Means and standard deviations are based upon observed data for the total group of 1,040. Correlations are based upon pooled within college z scores; that is, each measure was standardized individually by college.

*Based upon all courses completed in four years; includes students who withdrew.

Table A-13. The Overlapping Pattern of AP Examination Grades Submitted in Six Subject Areas

	History	*English*	*Language*	*Biology*	*Mathematics*	*Physical Science*
History	379	216	54	62	104	37
English	.42	618	82	78	128	47
Language	.19	.27	157	30	45	12
Biology	.21	.18	.16	183	68	25
Mathematics	.22	.19	.16	.21	382	72
Physical Science	.15	.16	.05	.18	.36	122

Note: Underlined entries in the diagonal indicate the number (among 1,115 AP students in a group of 4,814 freshmen) who submitted AP grades in each subject area. Above diagonal entries show the number who had grades in both of the areas indicated. Below diagonal entries indicate the correlation (coefficient) between AP grades submitted in these paired areas. Correlations were based on 1,776 students who attended heavy AP secondary schools.

Table A-14. Selected Profile of AP Students by Subject Area of AP Examination Submitted (% With Characteristics Indicated)

Profile Characteristic	*All AP*	*All Non-AP*	*Students Submitting AP Examinations in:*					
			English	*History*	*Language*	*Biology*	*Math*	*Phys/Chem*
FRESHMEN (N)	1115	3699	618	379	157	183	382	122
Background								
Women	50%	46%	58*	42%*	62*	44	41*	24*
Private School	28	22	27	29	37*	37*	29	21
Large Public School	26	19	29*	24	23	16*	26	25
Highly Educated Parent	29	23	28	30	31	35	30	28
Liberal Educ. Important	46	36	52*	49	59*	46	41*	35*
School Achievement								
Rank, Top decile	57	35	60*	53	59	53	70*	67*
SAT, 600 +	57	26	57	60	64	60	75*	77*
Academic Honors (5)	21	9	22	23	28*	20	26*	29*
Follow-through (5)	21	17	20	25	22	17	23	20
Personal Statement (>4)	13	9	15*	14	18*	14	13	13
School Reference (>4)	16	10	18	19	20	19	19	22
Persist to Senior Year	85	74	84	85	88	87	90	89
SENIORS (N)	952	2724	522	321	138	160	342	108
College Performance								
B Average, 1st Year	59	37	62*	57	61	53	68*	62
Early Graduate	3	1	2	4	1	4	4*	10*
Honor Graduate								
Predicted	37†	27	39†	38	40	37	43†	42
Actual	41	26	45*	41	45	38	49*	45
Most Successful								
Predicted	23	20	25	23	22	22	23	23
Actual	25	19	28*	21	26	20*	27	27
Adavnced Study								
Predicted	15	11	16	16	16	16	17	19
Actual	17	10	15	18	20	17	18	24

*Students submitting a grade in this subject area were significantly different from other AP students on this characteristic, $p < .05$.
†Actual performance differs from predicted, $p \leq .05$.

Table A-15. Percentage of Students Who Took a Year or More of Coursework or Majored in Particular Academic Areas—by AP Grade Submitted

Students Who	*AP Grade Submitted In:*						*AP Seniors*	*All Seniors*
	English	*History*	*Language*	*Biology*	*Math*	*Phys/Chem*		
Took a year or more coursework in:								
Literature/History	80%*	83%*	83%	80%	74%	65%*	77%	78%
Foreign Languages	48	47	61*	39	38*	25*	46	47
Biology	32*	29*	38	62*	42*	42	35	31
Math/Computer Science	51*	58	51	64	76*	82*	59	61
Physical Science	39*	41	41	55*	63*	83*	45	41
Majored in:								
English	22%*	14%	20%	16%	7%*	7%*	16%	12%
History	10	17*	8	5	6*	4	8	8
Language	7	7	20*	4	4*	0*	7	5
Biology	10	13	13	30*	17*	16	12	9
Mathematics	5	5	4	4	11*	11*	6	5
Physics/Chemistry	5*	6*	5	9	13*	26*	8	5
Diverse Coursework	23	23	27	31*	31*	27	24	23
Double Major	21*	21	25*	18	16	18	19	16
Quest. Respondents	368	232	102	112	246	72	650	2443
All Seniors	522	321	138	160	342	108	952	3676

Note: All categories overlap; that is, students often submitted multiple AP grades and took a year or more coursework or majored in more than one area. Coursework data were based upon senior questionnaire respondents; data on college major were based upon all seniors.

*Significantly different from other AP students, $p < .05$.

APPENDIX B. SENIOR QUESTIONNAIRE

RESEARCH QUESTIONNAIRE

Dear Class of '83:

Our college is participating in an important research study involving nine private colleges throughout the country. Your class is in the study group. You may recall completing one of the questionnaires when you were a freshman. The study is concerned with what role student characteristics, accomplishments, and goals play in admissions and how such qualities are related to subsequent achievement and progress in college.

The first phase of the study has been concerned mainly with the analysis of admissions decisions. The next step is to gather information about the activities and achievements of members of your class so that we can see how characteristics and goals of students at entry are related to a productive and successful college career. The purpose is to improve admissions practices, understand better how to advise students, and develop better college programs. We are collecting information from college records and from faculty and staff about many types of student achievement in your class. We are also especially interested in knowing your reactions as you reflect on your years of college and how you feel about your experiences here.

We urge your frank answers to the questions that follow, though your participation is voluntary. Fill in your name and birth date below only for identification in this study. Your responses will remain *strictly confidential.* Please return your completed questionnaire in the envelope provided. This study and your participation are very important to the college.

Thanks very much for your help.

Last name

First name

Middle Initial

Birthdate

month day year

If you entered college under a different name, please give us both names and indicate below (a) which name is new, and (b) which name is currently used by the college.

_____

_____

1 **Listed below are 12 common goals of college students. These are stated with exactly the same wording as they were presented on a questionnaire to your class in the freshman year. Given your experience in college, how do you view them now? Consider each one and circle one of the numbers 1-5 to indicate, from your perspective, how important you think each goal should be in college. Then go to question 2 at the right.**

2 **To what extent do you feel satisfied with the progress you have been able to make on these particular goals? Please circle + or − at the right of each goal as you feel appropriate. Mark each item. If you are not sure, circle the ?.**

Very Important ↓ | Important ↓ | Some Importance or Not Sure ↓ | Minimally Important ↓ | Not Important ↓

Satisfied ↓ | Not Sure ↓ | Dissatisfied ↓

5	4	3	2	1	01. My main goal in college will be to get training for the work I want to do, or make the grades I need to get into a good school after I finish here.	+	?	−
5	4	3	2	1	02. I see college as my great opportunity to read a lot, exchange ideas, learn about the significant cultures of the world, and generally to become an aware and more sophisticated person.	+	?	−
5	4	3	2	1	03. I'm an active person. I like sports and other outdoor activities. Developing my talents and interests in this area is important me.	+	?	−
5	4	3	2	1	04. I view college as a place where a person can learn practical skills valuable through a lifetime. I am especially interested in developing specific skills such as foreign language competency, computer programming, reading and math skills, good work habits, etc.	+	?	−
5	4	3	2	1	05. I don't want to just learn a lot of facts in college; to me it's very important to learn how to deal with those facts. For example, learning how to reason, evaluate information, and construct a defensible argument are high priorities for me.	+	?	−
5	4	3	2	1	06. Extracurricular activities appeal to me because they are a good way to get a lot out of your education; especially learning how to organize resources, work with others, and take the lead in achieving an objective. I hope to participate fully in this aspect of college life.	+	?	−
5	4	3	2	1	07. I am not at all sure what I want to do for a career. To me it seems important that I get a better sense of direction and I hope to do that in college.	+	?	−
5	4	3	2	1	08. I am especially concerned about ethical, moral, and religious issues. In the next year or so I would like to get a better sense of my own values in this area.	+	?	−
5	4	3	2	1	09. I would very much like to develop a meaningful relationship with another person while I'm in college. If it's lasting, good; if it's not, that's OK too.	+	?	−
5	4	3	2	1	10. I like to express myself creatively. I already have some talent in an area of interest to me (for example, theatre, music, painting, crafts, writing) and want to develop it further in college.	+	?	−
5	4	3	2	1	11. I am very interested in community and social problems and would like to learn more about what's going on in the world. The opportunity to get personally involved in some sort of significant community service activity or environmental project would be important to me.	+	?	−
5	4	3	2	1	12. In the next few years I would like particularly to develop more skill and confidence in dealing with different kinds of people. I think the social side of college is very important.	+	?	−

3 **In this study we are particularly interested in learning how students view "success" in college. Looking at these twelve goals on the previous page, in which area would you say you have made your MOST significant achievement or accomplished something for which you are especially proud? Indicate by circling ONE number.**

01 02 03 04 05 06 07 08 09 10 11 12

Could you please describe the achievement and indicate why you think it was significant?

We would like to quote some examples of significant achievement—altering names and facts as necessary to protect privacy. If you have no objection to our using your answer in this way, please check (✓) here ..... ☐

4 **In your case, which of the following have significantly *contributed to* or *detracted from* a successful and satisfying college experience overall? Check (✓) all that apply.**

Contributed to ↓	Detracted from ↓	
☐	☐	Ability to organize tasks and use my time effectively
☐	☐	Availability of financial resources
☐	☐	Health, attitude, eating and drinking habits, other personal factors
☐	☐	Personal contacts with faculty and staff
☐	☐	Personal contacts with students
☐	☐	Sense of direction, knowing why I am in college and what career I would like to work toward
☐	☐	Social life on campus
☐	☐	Time I have spent on special interests and activities out of class
☐	☐	Work experience during college or in the summer

5 **Which students do you feel best exemplify success in college? Print below the names of up to five students in your class whom you consider, overall, to have demonstrated the knowledge, skills, and qualities of an especially successful college student.**

6 **Objectively, how successful do you think your college career has been, overall? Check (✓) one.**

1 ☐ Very succesful
2 ☐ Mostly successful
3 ☐ Mixed
4 ☐ Not particularly successful

7 **Please circle how many college courses you have taken in each of the following areas.**

0	1	2	3	4+	Biological Science
0	1	2	3	4+	Computer Science, Math, Statistics
0	1	2	3	4+	Economics, Political Science
0	1	2	3	4+	Foreign Languages
0	1	2	3	4+	Literature, History
0	1	2	3	4+	Music, Art, Drama
0	1	2	3	4+	Philosophy, Religion
0	1	2	3	4+	Physical Science
0	1	2	3	4+	Psychology, Sociology, Anthropology

8 **What types of work experience have you had since fall 1979? Check (✓) all that apply.**

☐ Internship, full-time for 2 months or more
☐ Full-time job for 2 months or more, experience of limited long-range value
☐ Full-time job for 2 months or more, valuable experience but not related to my career interests
☐ Full-time job for 2 months or more, valuable experience and training related to my career interests
☐ Teaching or research assistantship in department
☐ Other part-time or temporary job

9 **What do you expect to be doing in fall 1983 (a year from now)? Check (✓) one.**

1 ☐ Completing my undergraduate degree
2 ☐ Going to graduate or professional school
3 ☐ Working at a job related to my long-term career
4 ☐ Taking a break (work, travel, etc.) while I decide what direction I prefer
5 ☐ Serving in the military
6 ☐ Homemaking
7 ☐ Uncertain at present

10 **What is your probable long-term career? Circle one.**

1 Accountant, actuary
2 Actor, entertainer
3 Advertising, public information
4 Architect
5 Artist, designer
6 Athlete, coach
7 Banking, finance
8 Business manager
9 Business owner, proprietor
10 Business sales, marketing
11 Clergyman, other religious
12 Clinical psychologist
13 College teacher
14 Communications, radio/TV
15 Computer specialist
16 Dentist
17 Dietitian, home economist
18 Ecologist, forester
19 Editor, publisher
20 Engineer
21 Farmer, rancher
22 Foreign service
23 Homemaker (full-time)
24 Interior decorator
25 Interpreter, translator
26 Law enforcement officer
27 Lawyer
28 Librarian
29 Medical technician
30 Military service
31 Musician, composer
32 Nurse
33 Personnel work
34 Pharmacist
35 Photography, graphics
36 Physician
37 Politics
38 Public Administrator
39 School counselor
40 School administrator
41 Scientist (researcher)
42 Social worker
43 Statistician
44 Student personnel (college)
45 Therapist (physical, speech)
46 Teacher (elementary)
47 Teacher (secondary)
48 Veterinarian
49 Writer, journalist
50 Skilled trades, crafts
51 Other
52 Undecided

11 **Have you investigated the characteristics and types of jobs likely to be available in fields of interest to you? Check (✓) one.**

1 ☐ Not much yet
2 ☐ I have picked up some information but not in a systematic way
3 ☐ I have spent a good deal of time seeking out specific information about types of jobs that interest me
4 ☐ I already know of a specific job or company I am likely to go into

12 **What is the highest degree you intend to obtain? Check (✓) one.**

1 ☐ B.A., B.S.
2 ☐ Master's or equivalent
3 ☐ Ph.D., M.D., Law or equivalent

13 **If you plan to go to graduate or professional school, in what field would it most likely be? Check (✓) one.**

1 ☐ Art, Music, Drama
2 ☐ Biological Science
3 ☐ Business
4 ☐ Computer Science, Math, Statistics
5 ☐ Economics
6 ☐ Education
7 ☐ English, Journalism
8 ☐ Engineering
9 ☐ Foreign Languages
10 ☐ History
11 ☐ Law
12 ☐ Library Science
13 ☐ Medicine
14 ☐ Physical Science
15 ☐ Psychology
16 ☐ Social Work
17 ☐ Other Arts and Sciences
18 ☐ Other Professional & Technical
19 ☐ Uncertain
20 ☐ None Planned

14 **Overall, do you feel that you have carefully chosen a career and made specific plans to enter it? Check (✓) one.**

Yes	Not Sure	No
1	2	3

Many thanks for your help. Please return the completed questionnaire in the confidential research envelope.

APPENDIX C. TECHNICAL NOTES

1. In Table A-2, data concerning educational goals were based upon 4,174 freshman questionnaire respondents, 1,015 of whom were AP students. The matched samples in that table included the 852 AP and 824 non-AP students with such questionnaire data. Data on career choices in Table A-2 were based on all freshmen; in this case Ns correspond to those indicated in tables A-1 and A-3.

2. Since one objective of this study was to compare AP and non-AP students on a number of measures of success in college, it is desirable to take account of preadmission differences between the groups on those measures known to be related to the various types of later success. Accordingly, logistic regression was used to predict AP status from the six measures found in Willingham (1985) to be the best indicators of overall success in college. AP status was predicted for all students across colleges. The "propensity score" thus derived (that is, predicted AP status) was used to match freshmen within colleges. See Rosenbaum and Rubin (1985) for discussion of the propensity score as a matching technique. The weights ($p \leq .05$ in each case) for the six measures that constituted the propensity score were as follows (standardized here by multiplying each by the standard deviation of the measure):

School rank	.11
SAT	.79
Academic honors	.06
Follow-through	.09
Personal statement	.10
School reference	.12

The results of the matching procedure are shown in Table A-4. Furthermore, since there was a substantial difference between the AP and non-AP groups it was not possible to match 13 percent of the (more able) AP students. Thus the full range of talent is not represented. All means for these observed variables are nearly identical in the matched groups, but as is always the case with matching or other forms of statistical control, the groups may not be comparable with respect to other unobserved variables. Following Campbell and Stanley (1963), there may be differential regression in the matching process since non-AP matches have more extreme scores on fallible measures, or in other words, the matched AP and non-AP students are similar with respect to the observed but fallible SAT score, but may differ systematically with respect to the unobserved "true score" on the SAT. The effect of this depends upon what model one believes. If decisions to take AP courses are mainly associated with unobserved variables that are not related to later success, then matching probably provides a reasonably good basis for comparison within the somewhat truncated range of talent represented.

3. Using the logistic predictions based on six preadmissions measures (see Willingham 1985; Table 5.2) as one predictor of leadership, AP status made a small but significant addition as a second predictor. When cumulative four-year average was added as a third predictor, the beta weight for AP status became insignificant. A parallel analysis for the "most successful" criterion gave the same result. In these analyses the college means for all variables were subtracted from each student's observed scores in order to avoid the noise introduced by arbitrary differences in the number of students included in the success groups from college to college.

4. In the total group of seniors, the incidence of departmental honor awards was higher among AP students than in the matched sample but not significantly so. In each college some seniors were awarded departmental honors, but in three institutions this success criterion was not strictly comparable because the honors programs were not emphasized and very few students (< 2 percent) were involved. In the six colleges with organized programs the difference between AP and matched non-AP honors recipients was larger (19 percent vs. 14 percent) and statistically significant ($P = .01$).

5. In Tables A-8 through A-11, and A-14, and elsewhere, unless otherwise indicated, predictions of scholarship were based upon two predictors (school rank and SAT scores), predictions of "most successful" were based upon all six school achievement measures shown in these tables, and prediction of admission to advanced study was based upon school rank, SAT scores, and stated intention at college entry to pursue a three-year graduate or professional program.

6. In the analysis of students from public versus private secondary schools, parochial school graduates were omitted. This group constituted about 5 percent of the total group of 4,814 entering freshmen at these colleges. It became apparent in the course of the study that student identifications of parochial schools were not reliable.

7. One might ask whether the various results associated with number of AP grades submitted would be any different if we had taken account of the secondary school program. Some students had no opportunity to submit more than one AP grade because there was no more than one AP course offered in their secondary school. To examine that question, the profile analyses (that is, Appendix A, Table A-11) were repeated with students who went to secondary schools that had five or more AP subjects available. The results were quite similar, though in some instances the differences noted were a bit larger and in the same direction.

8. Correlations in Table 4 were based upon 1,040 students who submitted AP grades and had complete data on other measures. All variables were standardized within colleges.

9. The average phi-coefficient representing the association between taking or not taking an AP Examination in two subject areas was as follows: .20 among the three humanities, .25 among the sciences, and .16 between these two clusters.